## POPULAR SCHENCE

Monthly

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PAGE 161

Countred types

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#### WHEN SICKNESS OR ACCIDENT STRIKES, YOU COLLECT GENEROUS BENEFITS

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#### STAY WELL AND GET CASH BACK

Why abouldn't your libspitalization pay you money backer you may well? Here's a plan that provides each to help you pay the bills when you're sick or hart—then, if you stay well you get money back. You can't less. If you need the money, it's thereste help your if you don't, you've built a savings account of your own. This new kindled protection, policy NC-761, is available only from Bankers Life: & Casualty Company as part of the famous Whites Cross Plan. Write tedny for your FREE BLUE BOOK; that gives full details, tells six advantages never before combined in one policy; No obligation.

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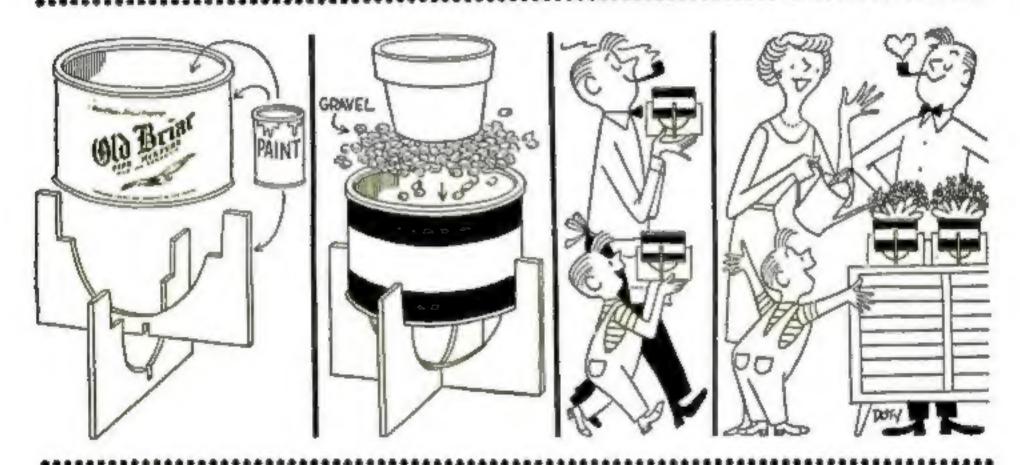
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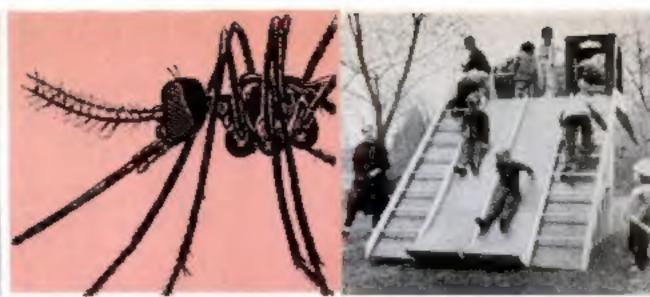
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OLD BRIAR IS ANOTHER FINE PRODUCT OF UNITED STATES TOBACCO COMPANY







Mosquito: Hateful pest with a marvelous tool kit. P. 112

For the Kids: Lots of fun in the PS playhouse, P. 127

Founded in 1872 Vol. 177 No. 1

Mechanics and Hundieraft uno. v. s. rav. ors.

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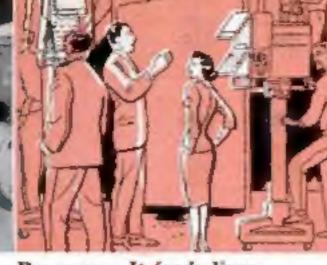
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Phonograph: Build it! Play it! Love it! P. 142

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## Monthly

#### America's **NEW-IDEA MAGAZINE** for 88 Years

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## PS Readers



#### **Those Stupid Speed Limits**

I would like to join the thousands who must be writing to congratulate you on Paul Kearney's article "Let's Abolish Stupid Speed Limits" [May].

I trust that the time is not too far distant when narrow-minded preoccupation with speed will no longer becloud the true issues.

> Donald E. Williamson Williamson Development Co. West Concord, Mass.

...Robert Moses' tart reply to Paul Kearney may apply to his outmoded parkways built for 1920 Sunday-afternoon drives. But it is better to drive at 70 on a safe, well-equipped turnpike than to stick below 40 on the old Hutchinson River Parkway.

The safety of a road is measured by how many decisions it compels a driver to make. In about every 40 decisions, an average driver will make one mistake, resulting in a scrape, a tight squeeze, or a bigger accident. On Mr. Moses' parkways—tight-laned, serpentine, sharp-curved slabs of concrete—drivers must make 10 times as many decisions as on the Connecticut Turnpike.

RONNIE YA DEAU, Leonia, N. J.

... I AM a driving instructor and I appreciate your courage in exposing the true killer on our highways—a killer that has been protected by advertising interests. Even our law-enforcement agencies feel the pressure of the brewery interests and are told to "take it easy" while thousands continue to die,

Perhaps your leadership will influence others in getting at the roots of our highway safety problem.

C. H. COURTNEY, Royal Oak, Mich.

... Cheers for the piece on abolishing stupid speed limits. Kearney's statement, "Being tough with rational people never pays off as well as being reasonable," answers the politicians and officials who advocate unrealistic speed limits.

TALK BACK

The killing agent is usually not speed but mechanical or human failure. If a person drives onto the N.Y. Thruway with a bald tire, reaches a speed of 60 m.p.h., has a blowout, and ends up splattered against a tree—is speed the cause of the accident?

The theory that speed kills has been spread in an attempt to avoid the problem by putting fear into a gullible public. I feel these limits will be abolished in short order by a more reasonable generation.

G. T. STARRS, Douglaston, N. Y.

#### Who Says Editors Are Cream Puffs?

What's happened to PS lately? A while back, it seemed to me, you had begun to wander away from my particular interests, which mainly concern machinery and engineering, new inventions, and workshop stuff. Now you're right back on the beam—the last few issues have been tops.

Best thing was the three-part series on the new compact cars [Jan.,Feb.,March]. This was a whale of a job of imaginative, unbiased reporting. Incidentally, I was surprised to learn what a rugged bunch you are. I'd always pictured an editor as a quiet, wispy guy with a green eye



shade, shuffling papers at a desk. But racking up 10,000 miles apiece on the Corvair, Falcon, and Valiant—within the four weeks allotted to each car—certainly weeds out the boys from the men. Congratulations.

G. W. Kendrick, Hempstead, N. Y.

POPULAR SCIENCE JULY 1960

CONTINUED

## PICK YOUR OWN SUCCESS STORY FROM THIS PAGE

These are the true stories of people who seemed trapped in routine, low-pay shaky jobs. Handicapped by lack of proper training, they couldn't get the things they wanted out of life-more money, a job they liked, security and happiness.

They are a small sample of the thousands of men and women-young and old-who turn to I. C. S. for help. Their will-to-learn plus I. C. S. training have changed the course of their lives.

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LIMESTONE HAULER: Francis Couch, Ottawa, Kansas, "Hauling out of limestone quarries is tough on tires. You've got to have Firestones!"



GRAVEL HAULER: Merle G. Ellsworth, Bloomington, Illinois. "I give tires a real beating but Firestones keep me rolling even in the toughest kind of going!"



HEATING CONTRACTOR: T. M. McKee, Memphis, Tennessee. "Firestone tires are the best buy in my book. They save us from expensive on-the-job downtime due to tires!"



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#### **Matey Conversations**

As a former chief mate on merchant ships, I was delighted with the "turn signals" for ships, invented in the Netherlands ["Picture News," April, p. 77]. So

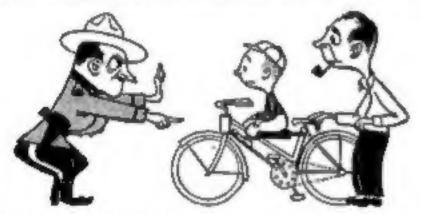
simple and so sensible.

I have another suggestion to reduce confusion at sea: direct bridge-to-bridge radiophone communication between the mates on watch. Most ship's officers speak English today and a single standard frequency could be decided on internationally. The major cause of collisions, I believe, is that each ship tries to outguess the other instead of following the Rules of the Road. A mate-to-mate talk while ships are still 10 miles apart would eliminate the guesswork.

ERIC MAXWELL, NYC.

#### **Bicycle Built for One**

Do you realize that in giving plans for making a second seat for a child on a bicycle ["Wordless Workshop," April], you are encouraging people to break the law—and their necks? Many states and



all the Canadian provinces have outlawed riding double on bikes.

J. A. Hill, Willard, Ont.

#### Out Go the Solar Cells

I REALLY enjoyed building your spaceage crystal set [Jan.] and showing it off to friends and relatives. I have discovered a better electrical source—a nine-volt transistor battery. Substituting the battery for the solar cells gives four times better sound reception.

JACOB REEFER, Chicago.

#### Wooden Hinge Designed by Pioneers

THE letter about the furniture locks used by Colonials [May] made me think you might be interested in hinges used in the Old West.

The early settlers of the West sometimes had to use material at hand. Instead of driving 10 miles by excart to the nearest general store, they used wood to turn out hinges for doors and gates. The miniature pair enclosed are just like the

big ones used on the door of a log house I lived in when a small boy. I am 85 years old and I've had lots of fun getting folks to figure out what these hinges are and how they were used.



W. M. NEWLIN, Excelsior Springs, Mo.

#### Mr. Rabinow and His Clutch

There is an amusing aspect to British acceptance of the Rabinow clutch ["New Shift Uses Magnetic Clutches," April] in the Hillman. The domestic rights to the Rabinow clutch are assigned to the U. S. Government. Because of this, any American car maker has royalty-free access to the patents. It has taken a foreign manufacturer, who must pay for the rights, to use the clutch in its most obvious application. Incidentally, the patents cover the dry-powder version, too.

Mr. Rabinow is no longer with the National Bureau of Standards, but has formed his own electronic and electromechanical engineering firm. This prolific inventor now has 62 patents in several fields. The automatic regulator, now a part of almost every American automobile clock, is a Rabinow invention.

A. O. Morse, Kensington, Md.

#### Converter or Inverter

In "Picture News" [March, p. 117], you state that a converter supplies 115-volt current from the 28-volt system of a Northeast Orient Airline Stratocruiser to operate an organ. A converter changes AC to DC. An inverter changes DC to AC.

C. F. LEHMAN, NAS, Miramar, Calif.

#### Citizens of Outer Space

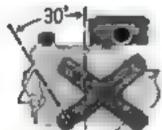
TALKING about extra-terrestrials ["U. S. Begins Search for Beings in Other Worlds," April]: Isn't it possible that any such creatures would have developed communications different from ours and thus would be unable to receive or send radio signals? If—as you say—some are more highly developed than we, that old standby of science fiction, telepathy,

C-syrganal nutriti

## Mobilgas Economy Run proves more car and more economy go together... if it's a 1960 car from Chrysler Corporation

Compact class	2nd Place -	VALIANT.	27 29 MPG
	1st Place-	PLYMOUTH	24 82 MPG
6-cyt. low	2nd Place—	DODGE DART	24 74 MPG
price class	3rd Place -	PLYMOUTH	24 73 MPG
	1st Place-	PLYMOUTH	22 88 MPG
8 cyl IDW price class	2nd Place	PLYMOUTH	22 52 MPG
pres class	3rd Place—	DODGE DART	22 28 MPG
Low medium price class	2nd Place-	DODGE	21 12 MPG
Upper medium	1st Place -	CHRYSLER New Yorker	20 87 MPG
price class	2nd Place-	DE SOTO	20 36 MPG

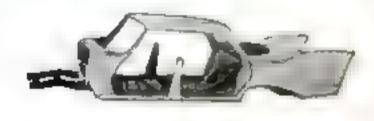




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More car... Torsion-Aire Ride irons out the bumps. Up front, torsion bars twist and untwist, hold wheels down. In back, leaf springs soak up bounce and pitch, help prevent seesawing.



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would be a possibility; or perhaps something completely unknown to humans. RAND RINTOUL, Amprior, Ont.

Since telepathy, if it exists, is only imperfectly developed here, scientists could hope that supersmart extra-terrestrials would recognize our backwardness and

talk to us the old-fashioned way-by

radio.

#### Back-Seat Peril

THE inventor of the crash seat that slides back upon engine impact ["New Ideas from the Inventors," May] seems



to have forgotten about the passengers in the back seat. The way you picture it, they're going to get clobbered.

P. S. KIRSHENBAUM, Brooklyn, N. Y.

#### And It Worked

MY COMPLIMENTS on the high quality of Joseph Whitehill's article ["Ball-Turning Attachment for a Lathe," March]. The blueprint was so interesting and instructive that I immediately set to work. The device worked exactly as you said it would.

R. H. Tyrrell, Oakland, Calif.

#### Verse from the Past

READERS of "PS Puzzlers" [May] may be amused by this solution Lewis Carroll received to his problem of the Old and the Young Knight:

The elder and the younger knight,
They sallied forth at three;
How far they went on level ground
It matters not to me;
What time they reached the foot of hill,
When they began to mount,
Are problems which I hold to be
Of very small account.

The moment that each waved his hat
Upon the topmost peak—
To trivial query such as this
No answer will I seek.
Yet can I tell the distance well

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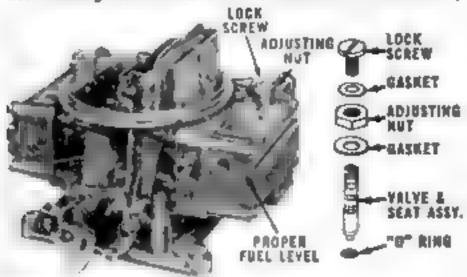


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## ONE SIMPLE ADJUSTMENT TO YOUR HOLLEY CARBURETOR

If you are getting poor idle or unsatisfactory fuel economy, one cause may be improper fuel level in the bowl. Because of the accessibility of the adjustable needle and seat arrangement on Holley 2-barrel and 4-barrel carburetors,



it's a simple matter to check the fuel level. Here are the easy steps: (1) Make sure the car is on level ground, then start the engine. (2) Remove the sight plug to check the fuel level in the bowl. (It should just reach the lower lip of the sight plug.) (3) If the level is too high or too low, loosen the lock screw with a screwdriver. Turn the adjustment nut clockwise to lower the fuel level-counter-clockwise to raise it. A 1,6 turn is the equivalent of 1/16-inch wet fuel level in the bowl. (4) Operate the engine until the fuel level is stabilized, then recheck level at the sight plug. Be sure to replace the sight plug. This adjustable needle and seat arrangement is one of many important developments of Holley's continuous research and engineering. There are, of course, other causes of unsatisfactory idle and economy. If this simple adjustment does not correct the trouble, your Holley dealer will be glad to make a thorough check of the carburetor.

\* \* \*

When you make your own carburetor or ignition repairs and parts are required, be sure to use genuine Holley parts. Your Authorized Holley Distributor or Dealer, listed in the Yellow Pages, has a complete stock of Holley carburetor minor over-haul kits, tune-up kits, ignition parts, and brand-new replacement carburetors priced competitively with rebuilts. All are engineered and built to exacting original equipment standards. It will pay you to buy or specify Holley Parts.



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C-1

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ORIGINAL EQUIPMENT MANUFACTURERS FOR OVER 55 YEARS

They must have travelled o'er: On hill and plain, 'twixt three and nine, The miles were twenty-four.

Four miles an hour their steady pace
Along the level track,
Three when they climbed -but six when
they

Came swiftly striding back
Adown the hill; and little skill
It needs, methinks, to show,
Up hill and down together told,
Four miles an hour they go.

For whether long or short the time
Upon the hill they spent,
Two thirds were passed in going up,
One third in the descent.
Two thirds at three, one third at six,
If rightly reckoned o'er,
Will make one whole at four—the tale
Is tangled now no more.
JEAN OSTEND, Yonkers, N.Y.

#### More on Stud Holes

Has that letter writer [April] ever tried using a sharp bit and a doorknob for a brace to make stud holes for electric cable? In the first place, it would take a Hercules hours to drill through a stud in this manner. In the second place, if you string wire near the flooring, there is danger of nails being driven through the cable, causing a short circuit and a serious fire hazard. This could happen



when a workman installs new flooring or floor cabinets in the room above. In the third place, angular holes hold the cable in place and make a neat, safe job.

ROBERT NICHOLAS, Dorchester, Mass.

#### Minute Walls and Pendulums

In May, you agreed with a letter writer that two steel balls rolling in an inverted semicircle will always meet at the center regardless of their starting positions. I disagree.

The trough should be an inverted cycloid, not a semicircle. A cycloid is de-

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President,
First Western Savings



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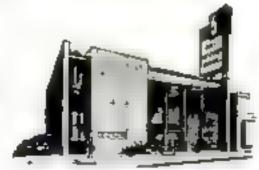
Remember: at First Western interest is paid quarterly on all accounts. Withdrawals have always been paid instantly. Airmail postage is prepaid both ways. Funds received by the 15th of any month earn from the 1st. \$1.00 opens an account.

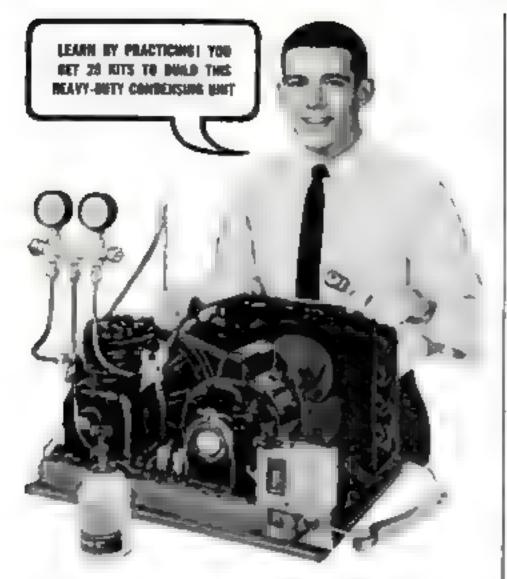
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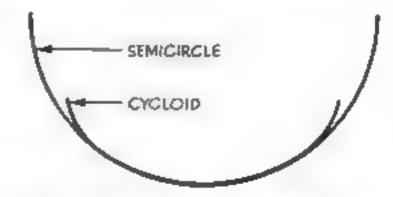
## Air Conditioning and Refrigeration— the uncrowded top-pay field

Make no mistake about it: Your opportunities to make big money are best in the uncrowded air conditioning and refrigeration field. Judge for yourself! During a recent 6-month period, the production of commercial compressors increased 40%! Over 3 million refrigerators, freezers and air conditioners are sold yearly. Today more than 150 million units need maintenance Experts say that 20,000 newly-trained technicians must enter the industry annually to fill top-pay jobs or to open service shops. Learn at home in spare time by practicing. CTI sends tools and parts to build a ¼ hp commercial-quality condensing unit. You build a refrigerator, freezer, air conditioner or milk cooler. Many students earn money fixing units while training.

Moli coupon for new catalog and lesson samples. No cost nor obligation. See if air conditioning isn't really best for you—casiest to master—more loaded with big-job opportunities. Act now!—Commercial Trades Institute (a non-profit organization), Chicago 25, Ill.

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fined as the locus of a fixed point on a given circle that rolls without slipping along a straight line. An inverted one will look like this.



It is a parametric curve—not the same curve as that of a circle.

A. L. JOHNSON, Royal Oak, Mich.

"Camera Catches Laws of Nature" [Feb.], "longer arcs—or shorter ones—take exactly the same time," But not at 90 degrees, as Mr. Karl suggests.

Increasing the amplitude (angle from rest position to extreme of swing) will increase the time required for a cycle. At 90 degrees, it would be increased 16 percent.

Also, for both balls simultaneously to reach dead center with their centers of gravity, the one released from a lower position, and traveling more slowly, would have to pass the center with its leading edge earlier than the other ball. If both are traveling in the same trough, the leading edges will meet on the side where the higher release was made.

R. P. SPIRO, Bronx, NYC.

#### TV at Sea

WE ARE very pleased with your article on our S.S. France ["World's Biggest Liner," May] but have spotted an overenthusiastic claim made for the vessel: "Every cabin will be air-conditioned and will have TV."

It is true that the entire ship will be air-conditioned, but the line never contemplated having TV in every room. Certain rooms might be equipped with closed-circuit TV sets just as certain rooms will be equipped with telephones.

PIERRE SIGNORAT French Line, NYC.

#### Oiling a Diesel Crank

I've studied the diagrams on the new midget diesels [April], but there is still one thing that bugs me. Air is pulled NOW...CET EVERYTHING YOU NEED TO PREPARE TO EARN REAL MONEY IN

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## Coast photographer discovers oil!



Paul L. Stover, of Stover Studio, Oakland, discovered the world's richest, most complete motor oil—Pennzoil Z-7. And, to hear him talk, you'd think he had *struck* oil! He says:

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This amazing 100% pure Pennsylvania motor oil is so rich it gives double the protection demanded. So complete you never need extra additives. Contains special power ingredient Z-7 that keeps engine parts so clean the oil can give peak protection full time, with regular changes.

Your favorite dealer can supply you with Pennzoil Z-7. Ask for it by name—sound the "Z" that makes Penn Oil—

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Member Penn. Grade Crude Oil Assn. Permit No. 2, Oil City, Pa. into the crankcase and then forced into the cylinder. What do they use to lubricate the crankshaft? And if they use oil, how do they prevent the oil from being sucked into the cylinder? DONALD BRASSARD, Brunswick, Me.

The engine has a separate metered lube-oil pump, with four outlets. Two lines are connected to the cylinder's thrust side, two to the crankcase, where they drip lube oil next to the bearing

#### His Wankel Works

My son and I built this Wankel engine largely from descriptions—in PS



and a sports-car magazine—and it is

running successfully,

We used brass cases and a steel rotor fitted to .0002-inch side clearance, so the only vanes are the three end sealers at the rotor apexes. The engine runs smoothly and shows no sign of binding after a five-minute run at 6,000 revs. A 11-inch hole connects the plug chamber of the side-mounted plug to the combustion chamber, and the plug gap needs to be fairly large for good ignition. Balance is excellent.

W. W. THOMAS Sa., Daytona Beach, Fla.

We're delighted, and awed, that you were able to build a working machine from the scant information available. Congratulations on a remarkable job.

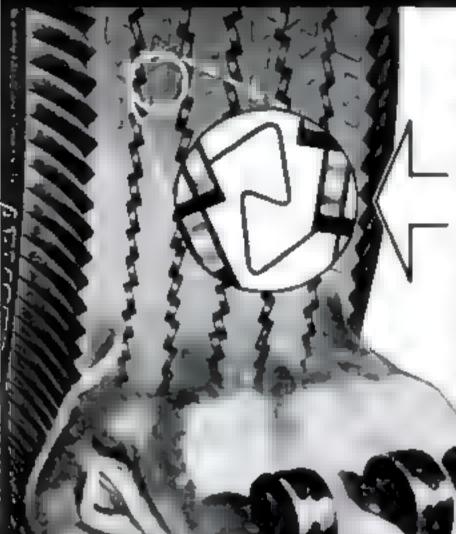
#### His Engine Was Missing

HAVE any other Falcon owners had the trouble that I have had—the engine missing in second gear? My dealer finally changed the jets in the carburetor, put in new plugs, and reset the timing. Now the car works fine, but I get only 18 m.p.g.

E. W. CHRISTMAN, Massillon, Ohio.

As our February article indicated, all [Continued on page 44]

## TIRE FACTS THAT CAN SAVE YOUR LIFE



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## ONLY ARMSTRONG TIRES HAVE PATENTED SAFETY DISCS

—Grip the road to stop deadly skids as no other tires can!

#### ARMSTRONG TIRES



#### ORDINARY TIRES



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Like fist above with dises between fingers, tread CAN'T squeeze shut. Hundreds of Armstrong Safety Dises held treads gripping edges open, always ready to "bite."

#### TREAD CAN CLOSE

Without discs, tread CAN squeeze shut, like fist ab ve. Tire's gripping edges are pushed together, lose their grip Even brand new tires can go smooth like this ... and you skid!

ARMSTRONG RUBBER COMPANY

Home Office, West Haven, Connecticut

### PS Puzzlers By Joan Steen

Test your mental muscles . . . Answers on page 230



#### Do You Know the Riddle of the Sphinx?

WHAT is it that is four-footed, two-footed, and three-footed? According to Greek mythology, Oedipus knew, and so mortified the Sphinx that she threw herself over a cliff.

Myths and legends abound with such "temple" puzzles, where the gods act as oracles and challenge man to interpret their veiled sayings by solving a riddle. (What more proof do you want of man's inherent need to be "puzzled"?)

The tradition goes on, for here's a modern temple puzzle I heard recently.

The oracle in a certain temple answers the questions posed by the faithful through the mouths of three gods, whose identical images are set up in a row. Trouble is, no one's sure which god is which. One is the God of Truth, whose answers are always reliable. One is the God of Falsehood, whose answers never are. And the third, aptly called the God

of Diplomacy, sometimes speaks truly, sometimes not.

The priests, who know their identities, do a fine business of interpreting.

One day a poor beggar came to the temple and decided to try his luck in finding out which god was which. He asked the image seated at the left, "Which god sitteth next to thee?"

"The God of Truth," was the answer.

To the God in the center the beggar
said, "Who art thou?"

"The God of Diplomacy."

Lastly, the beggar turned to the image on the right and asked, "Who sitteth next to thee?"

"The God of Falsehood," he said.

"O-ho," said the beggar, "so that's the way it is." And before long he set up shop in successful competition with the priests, for now he too knew which god was which.



HERE'S a breather from some of the stickier puzzles I'm told I sick upon readers every month. (I protest I can't do them all, either!) These are "relative" problems—the first two are easy, the third you can probably make a good guess at.

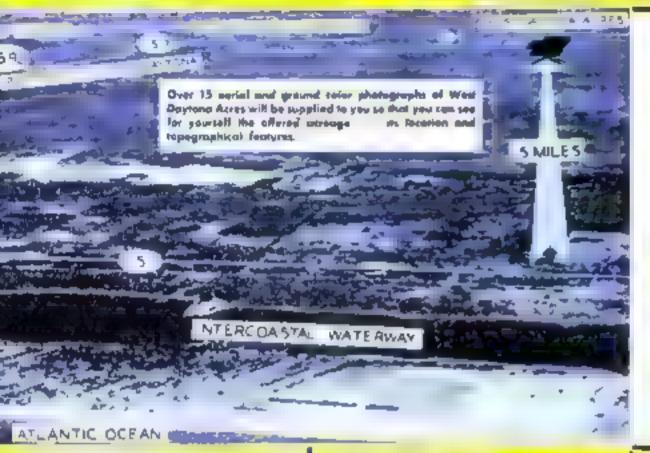
 Two fathers and two sons sit down to breakfast and divide three eggs among them (not by scrambling). How come?

2) "Ugh," said the big Indian to the little Indian as they stood upon the peak. "You are my son, but I am not your father." How come?

 This one's from Lewis Carroll: The Governor of Kgovnji wants to give a very

## NOW! A FLORIDA INVESTMENT YOU CAN MAKE WITH CONFIDENCE

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- West Daytona Arres has a mean elevation of 55 ft. (Source: Engineer's Report )
- West Daytone Acres is located in the Golden Triangle, famous for the explosive prowth of missile-connected industries within its boundaries.

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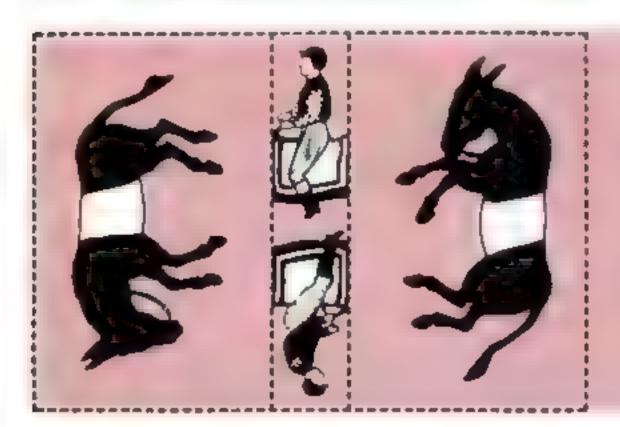
MILE PAR

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#### PS Puzzlers continued

small dinner party, and he means to ask his father's brother-in-law, his brother's father-in-law, his father-in-law's brother. and his brother-in-law's father. What do you suppose is the minimum number of guests possible?



NE of Sam Loyd's most famous picture puzzles was "The Donkeys and the Riders." The problem: Cut the puzzle apart in three sections as shown, and fit the riders on the animals' backs in the normal way. No fair snipping the riders apart to seat them separately

**IA**/ANT to compete with the Russians? Here's a sample question from an entrance exam for nontechnical Soviet college students. Not a puzzle, it simply tests basic science knowledge:

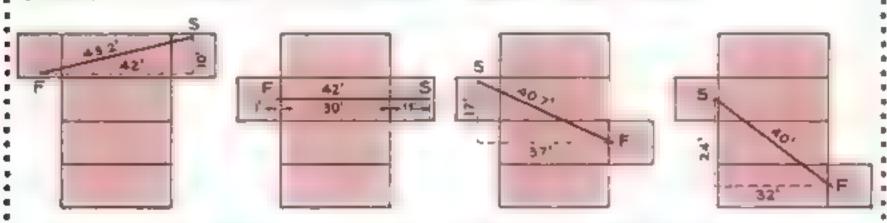
You have two steel bars, apparently identical, clinging together side by side.

"One of these," you are told, "is a powerful bar magnet. The other is soft steel. Using no outside equipment, you are to determine which is which. You may pull them apart, but may manipulate them only once—that is, put them in only one other position—before answering."

#### Puzzle of the month

TRY playing your way to the solu-need two players and a number of counters (matchsticks, coins, whatever's handy). The game is "Nim," probably one of the simplest games ever invented. All you do is take turns picking up a number of the counters

(up to a fixed maximum). The idea is to make your opponent pick up the last one. He's the loser. Silly? Wait'll you start playing it. There's a neat strategy which, if you can figure it out, will always insure victory to the first player. Now to pin things down. Try 21 counters and make the maximum to be picked up at a turn five counters. (Answer next month.)



Answer to last month's F-0-T-M. The solution to the spider-fly problem is best seen by diagram. The problem is one in geodesics—the science that deals with shortest distances." The trick is to conuder the various ways the form of the room, a rectangular solid, could be folded

together from a flat sheet of paper. One way cuts the distance between spider and fly to 40 feet—all the more remarkable when you refold the paper and see that in so doing the spider has to cross five of the six surfaces of the room! (Right triangles show the ways distances were computed.)

## DON'T BE HALF-TRAINED.







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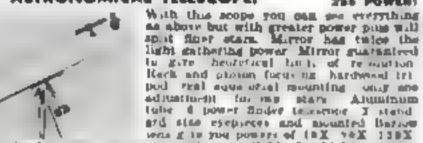


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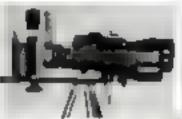
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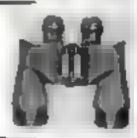
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## The month in science

Liquid machines. Three Army scientists have invented a remarkable new way to put fluids to work. It suggests, among other things:

- Automobiles that, from engines to wheels, employ nothing but fluid-filled pipes—no moving parts at all.
- ▶ Phonographs that operate by compressed air, without vacuum tubes, transistors, or anything electrical.

The new system, called pure fluid controls, was invented by B. M. Horton, R. E. Bowles, and R. W. Warren of the Diamond Ordnance Fuze Laboratory. Their strange devices can do what is now done by gears, valves, and vacuum tubes, yet they consist

#### How streams of fluid make an amplifier

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only of weirdly shaped conduits for streams of liquid or gas. Nothing moves except the fluid, and there is no electricity. You could use them as amplifiers for phonographs, for instance, or switches, or even memories for automatic computers.

Fluid controls are old and widely used (just in automobiles there are torque converters, windshieldwiper mechanisms, and the gadgets that operate power options such as brakes, steering, and window lifts). But these have always combined fluids with mechanical elements-pistons or valves. And the mechanical parts are heavy, they wear out or break -and worse, they are slow. The new idea is to replace the mechanical elements with extra streams of fluid. One stream of fluid controls a second stream of fluid. It's much like a vacuum tube, in which one stream of electricity (the signal) controls a second stream of electricity (the output).

Basic element in this new system is the pure fluid amplifier. Like an electronic amplifier, it makes big ones out of little ones by shaping a powerful output to dupli-

cate a weak input. The output and input are streams of liquid or gas. The amplifier is a metal block containing channels connected to the fluid-carrying pipes (see diagram). The weak "control stream" (input) pushes sideways against the strong "power stream" (output), moving it so that more or less gets to the output channel. Adding a few extra channels to the fluid

#### The month in science continued

amplifier makes it a "flip-flop," a special kind of switch used in automatic computers.

The Army is excited about the fluid system (for automatic controls for guns, tanks, planes) because:

- ► It is foolproof—no moving parts, no electricity, just plumbing.
- ▶ It should work under any conditions of heat or cold.
- ► It can't wear out.
- It should be cheap to make.
- It operates much faster than mechanical systems (fast enough to handle audio frequencies), but slower than electrical systems. Pure fluid controls look like a natural for such things as wind-shield wipers and seat shifters. The fluid amplifier might also make a radical new kind of automatic transmission. Present transmissions are torque converters—they trade speed for push without changing the energy delivered to the wheels. The amplifier could vary the energy transmitted from engine to wheels. That might lead to a complete hydraulic drive: the engine pumping fluid to individual turbines at each wheel.

Fiber-glass igloos. It had to happen. They're trying to make better ice. Not for skating or Scotch-on-the-rocks, but for airplane runways, buildings, missile pads, and even floating islands. Ice

Reinforced ice holds a typewriter.

and snow cover 10 percent of the earth, a 10 percent that is interesting, strategically important, and a very long haul from building-supply dealers.

The trouble with ice—the way nature made it—is that it isn't strong enough. Runways of ordinary ice have to be four to six feet thick. So Prof. W. David Kingery of MIT is working on ice alloys (oddly enough, he's an expert on high-temperature ceramics). First result of his research is fiber-glass-reinforced ice. Mixing in four percent of the glass fibers makes ice 10 times stronger, as the photo at left demonstrates. Another alloying material is sawdust, which triples the strength of ice. The British developed that idea during World War II; they envisioned (but never built) a huge floating

airfield (2,000,000 tons) to be scooted close to the enemy shore. One problem still troubling Professor Kingery: The ice melts.

What you can do with old uranium. Ever think of making burnedout uranium into insect repellent? That's one of several dozen
non-nuclear uses for depleted uranium that have been suggested
by the AEC, which worries about getting stuck with 10,000 to
20,000 tons of the stuff a year. Among the other applications:
dyes and pigments, medicine, gold-hardening alloy, counterweights for airplane flaps (uranium is heavier than lead). The
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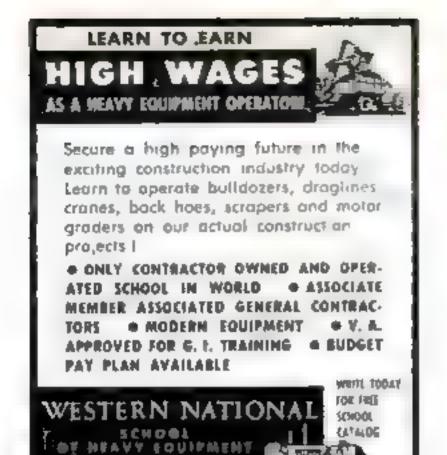
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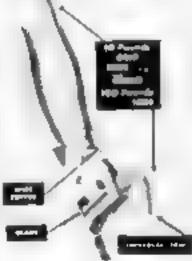
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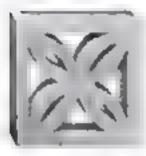
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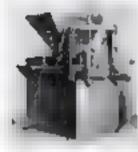
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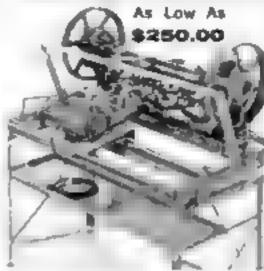
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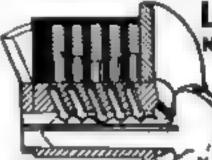
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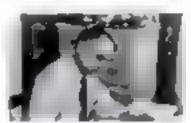


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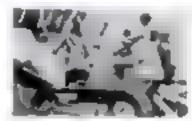
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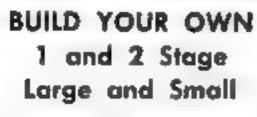
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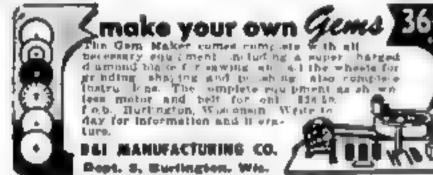


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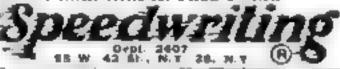
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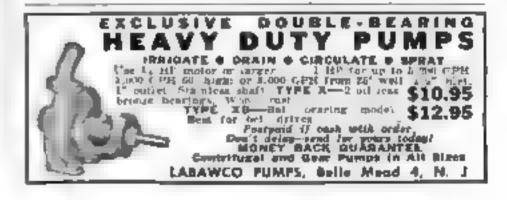


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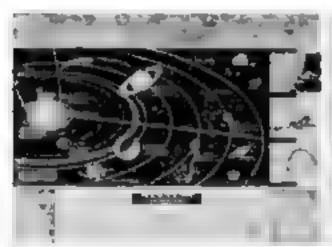
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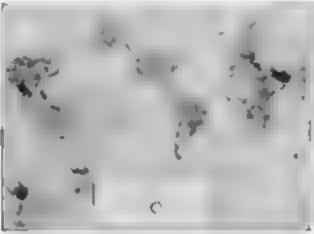
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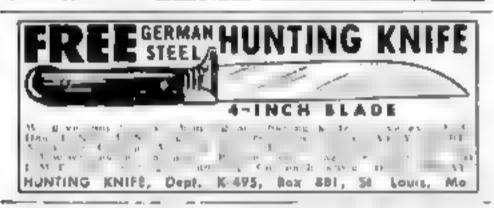
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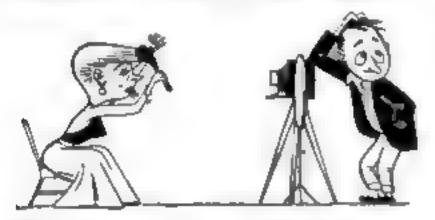
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[Continued from page 16]

that Reader Christman's Falcon probably needed was to have the timing set right after the car was broken in. The bigger jets are costing him gas mileage.

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WE ALL use our plain, ordinary mirrors with satisfaction. In view of this, can you explain why David Ugent, photographer ["Picture News," March p.



125], must use closed-circuit TV so a sitter can "pick a pose"?

BARBARA CHAIM, Denver.

Possibly so his sitters can see exactly how they will look in their pictures—not in reverse image as seen in a mirror.

#### It's Cold Out There

I'm LIKE to know if very cold temperature will lower the amount of uranium needed to make an atomic reaction take place? To put it another way, will cold speed up an atomic reaction?

Also: Can the speed of light be slowed by intense cold? Naturally, the light would have to be traveling through some

very cold gas.

Just why is it that men would suffer intense cold in space? With nothing to absorb the heat given off, it does not seem to be right. Perhaps I am missing a simple point here.

J. W. Legler, Hanover, N. H.

All available evidence indicates that cold has no influence upon the speed of an atomic reaction or upon the velocity

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#### Comet Vs. Falcon

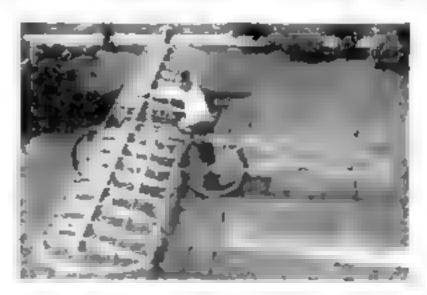
How do you explain the Comet's top speed of 90 mp.h. ["Ford's Not-Quite-So-Compact Car," March] as compared with the Falcon's 78? The Comet is larger and heavier but uses the same 90-horse six. My Falcon registers 95. Allowing for a five-mile error, this is still 90.

GLENN McDuffte, Tuscaloosa, Ala.

Auto Editor Ken Fermoyle comments: "Cars differ. As for the Comet, the one I drove was a finely tuned engineering test car wrung out under controlled conditions at Ford's Arizona proving ground. If the Comet is, indeed, faster than the Falcon, I suspect that its axle ratio (3.56 as against 3.1) actually contributes to, instead of inhibits, its top speed."

#### Pedaling into Space

AFTER reading about the leg-powered flycycle ["Picture News," April], I hunted up this 1927 snapshot of another hope-



ful "flybike." I built this one for my son It had an operable rudder.

The idea was to pedal fast down a slope and take off, then balance with the body in lieu of ailerons. It stayed on the ground—but the kids sure got exercise.

Hr Sibley, Nuevo, Calif

#### No Spilled Milk

Please tell the fellow who wants a cap to make it easier to pour from a milk bottle ["I'd Like to See Them Make," April] that we make a rubber cap with a pouring spout. He can get one to fit a quart bottle or a gallon jug of milk.

W. H. Trexler Jr.

Trexler Rubber Co., Ravenna, Ohio.



# HERE'S A MONEYMAKER FOR YOU!

#### make from \$3 to \$6 an hour with the FOLEY SAW FILER

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"When Mr. Potrick got his Folloy Saw Filer in Merch 1946 he made a good and wonderful investment. He has done to well that we bought a house and paid for it, bought ew car, byel ga addition to our \$3,000, Not so bad it's all paid for." Mrs. Leslie Patrick, Hough.

"I made \$765 fast year fling sows, and it ture comes in hosely. I do the work in my spore lime." -Jones J. Williams

"Last year's profa mounted house. Nicett of all, for a one-mon outfit."-Charles C. with repeat orders."

"I have done 4 or 5 thousand saws in my spore time in the 4 Vz years since I got the outfit, and they are all coming back



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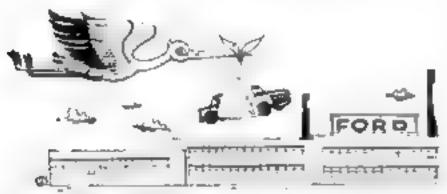


#### Splitting Engine and Transmission

RUMORS of a unique drive train for the compact Pontiac are correct. Engineers plan to divorce the engine and transmission of the new compact (it will be called Tempest, and unveiled in October). There'll be a bell housing up front, bolted to the engine, but inside it there'll only be a flywheel.

In the rear will be a "transaxle"—a

combination of fluid coupling and planetary gearbox on automatic jobs, or gearbox and clutch on manual-shift cars. In place of the conventional tubular shaft there'll be a small, solid, torsion-bar-like shaft to transmit power from front to rear. The floor tunnel will be smaller as a result, and also the hump on the front of the toe board.



Baby Falcon "go-ahead." Circling the roads of Ford's proving grounds are disguised prototypes of a small car slated to compete directly with economy imports like the VW and Renault. The baby Fords won't be ready this fall when other 1961 models appear, but you can look for them to hit the showrooms shortly after next January 1.

The prototypes look like Saabs and Anglias, but Dearborn-designed chassis hide under those camouflage bodies. All use liquid-cooled, cast-iron engines displacing about 90 cubic inches—mounted

up front and driving the front wheels.

The engines differ in design; in-line and opposed fours and V-4s have been tried. Two narrow-angle V-4s, one with a 20-degree V and the other with a wider 30-degree V, intrigue engineers particularly. They like their compactness. The V-4s are shorter than in-line fours, and —due to their narrow angles and staggered cylinders—not much wider. This compactness would help in designing a comfortable four-passenger car with a 96-inch wheelbase and curb weight of 1,650 lb.—the figures Ford hopes to hit. (By comparison, the VW's wheelbase is 94.5 inches and its weight 1,620 lb.)

Styling rumors say that when the little Ford sheds its Saab false whiskers it will look like a relative of the Falcon, with a dash of the English Ford thrown in for good measure. Kind of an Americanized Anglia.

Watch those oil drips. Valiant service engineers warn that care should be taken to prevent oil from dripping on the Valiant's steering idler-arm bushing when changing the oil filter. The bushing is made of natural rubber, which oil deteriorates rapidly—and the bushing's location makes it very vulnerable. It's located

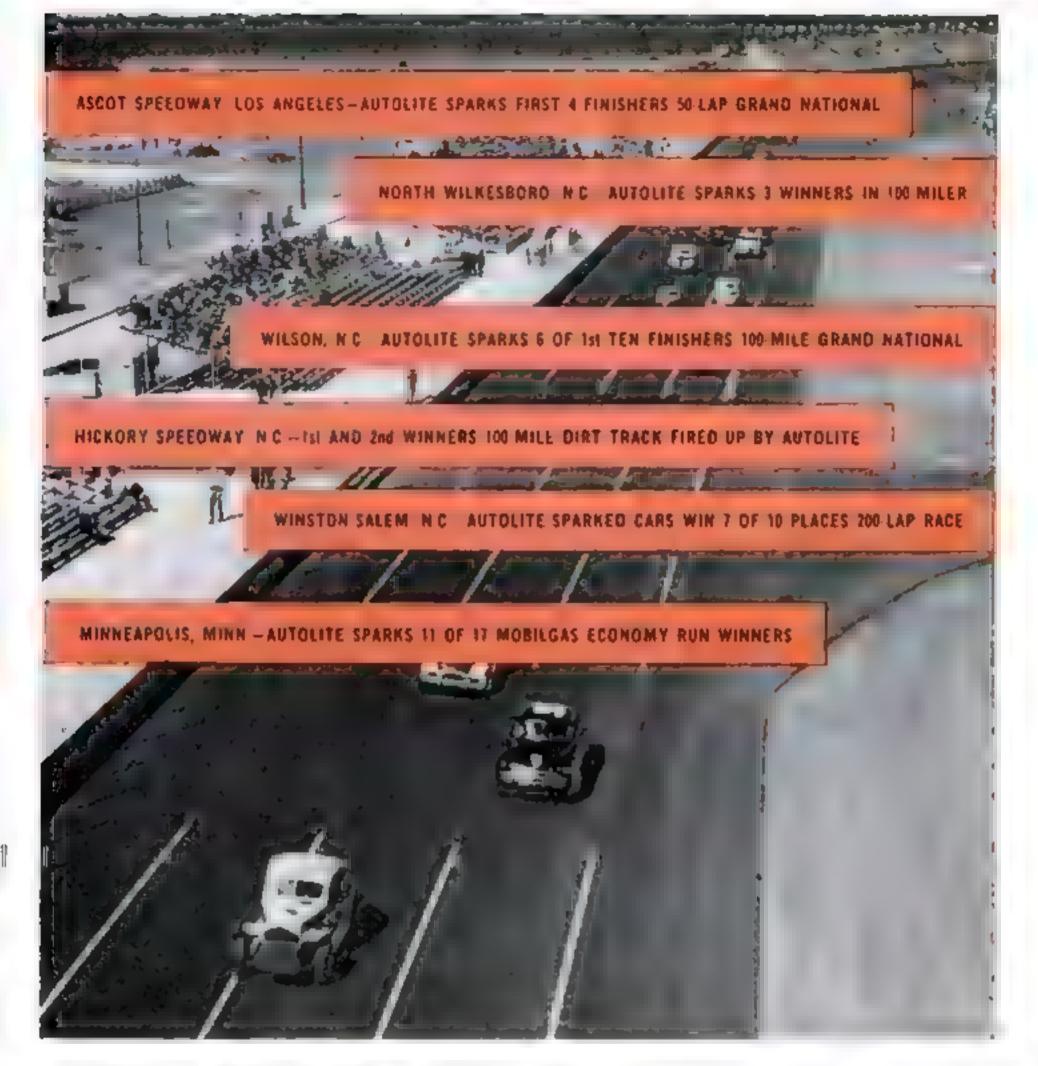
directly below the filter, and, due to the angle of the oil-pump mounting, a small amount of oil flows from the pump body when the filter is removed.

Service experts advise wrapping a cloth around the pump to prevent leakage when the filter is removed. If oil does spill, wipe it off the bushing immediately

Driving the four-speed Corvair.

If you like to shift for yourself, besides enjoying a touch of sportiness in your car, try to find one of Chevy's mildly souped

Corvairs with a four-speed, stick-shift transmission. It's a delight. An extra 15 horses (total: 95) give the little compact noticeably more go; getting from zero to



#### In the winner's circle from coast to coast

Yes, Autolite Spark Plug equipped cars everywhere are scoring! They're proving the difference ignition engineering makes in performance and economy. Whatever car you drive, you can enjoy the outstanding performance of Autolite Spark Plugs, tool See your dealer and ask for ...



IGNITION ENGINEERED FOR ALL CARS

Now! Autolite sponsors the election news with Dave Garroway on NBC-TV TODAY Show—and "News on the Hour," NBC Radio,

#### **DETROIT REPORT continued**

60 m.p.h. takes just 12 seconds, 5 less than the PS test Corvair checked last fall. Passing time, from 40 to 60, takes less than 10 seconds, compared with about 13 for standard 80-hp. Corvairs.

The modified engine has a hotter cam, heavier valve springs, slightly bigger carburetors, and a larger-diameter tail pipe. It idles a bit faster and is a shade noisier than the standard engine, but isn't hopped up enough to hurt its low-speed docility in traffic.

The transmission, synchronized in the three lower gears, is a dandy. (Leaving

fourth gear nonsynchro—instead of first, commonly the nonsynchro gear in four-speed boxes—makes sense. It's harder to downshift smoothly into first with no synchromesh help than it is to slip easily into fourth.) The floor-mounted shift lever slices from gear to gear without hesitation, binding, or crunching. Lever-throw distance is comfortably short. Only unfortunate thing about either the gear-box or optional engine is that both are in short supply and likely will stay that way until after the 1961 Corvairs make an appearance.

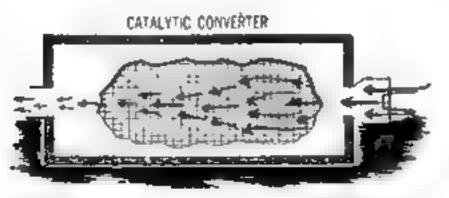
Corvair wagon coming. The compact Chevy station wagon due to hit showrooms this fall when the 1961 Corvairs appear will be built like a brick—literally. Shaped like a box with rounded corners, the Corvair wagon reminds those who have seen it of the VW Microbus. It's roomy for its size, and functional, but

not flossy or highly styled like current U.S. station wagons.

Designers specified a drop-down tailgate, but the platform loading height is rather high due to the Corvair's rearengine, rear-drive arrangement—which dictated the unorthodox shape of the upcoming wagon,

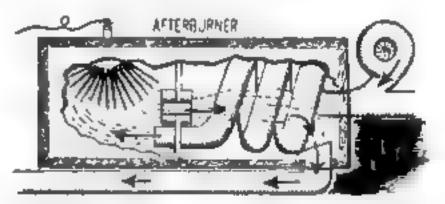
More power for T-Bird. Along with a complete restyling for 1961, Ford's Thunderbird will offer a bigger, more powerful standard V-8 engine—390 cu. in., more than 350 hp. (Whether this means the big 430-cu.-in. Lincoln V-8, currently an option, will be dropped for T-Birds is uncertain.) More important,

better braking will result from a switch to one-piece aluminum wheels and brake drums. Cast as a unit with iron facings on the brake surface, the new wheels will reduce fade during severe braking. Kelsey-Hayes is expected to make the wheels for Ford. They may be used by Lincoln, too.



Anti-smog cars for California. One year after the state approves two or more exhaust-purifying devices, all cars—new and used—sold in smog-ridden California will have to be so equipped.

What types of anti-smog devices are likely to be approved first? Catalytic converters and afterburners are the top candidates. Converters mix air with exhaust, filter it through chemicals that change hydrocarbons to harmless carbon



dioxide and water. Afterburners ignite exhaust gases and unburned fuel to complete combustion, eliminate carbon monoxide.

Catalytic converters should be cheaper initially, but replacing the chemicals every 15,000 miles or so might cost \$30 or \$40. Afterburners cost more at first. They must withstand temperatures up to 1,700 or 2,000 degrees Fahrenheit, which requires expensive materials. But, properly built, they should last the life of the car.

48 POPULAR SCIENCE JULY 1940

TRIPLE EXPOSURE at /11 is how our Speed Graphic caught this fellow flexing his muscles. Just try this exercise yourself. See how fast you tire out. When you do, remember that tires do 700 "push-ups" per mile as they roll along under your car.



Too much flexing wears out people...and ordinary tires! But not

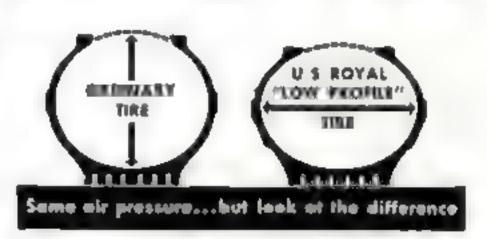
### THE TIRE THAT DOESN'T GET TIRED

# New Low Profile\* tire is actually made lower and wider so it flexes less, lasts longer.

Excessive flexing is what wears out, burns out tires, weakens rubber and fabric, increases blowout danger. And ordinary tires do flex excessively.

But U.S. Royal has pioneered a new "Low Profile" shape tire that flexes less, runs cooler, lasts longer. It offers new protection against highspeed failure and heat blowouts.

Other tire designs don't give such thorough protection. Yet "Low Profile" tires cost no more than ordinary tires. So don't run the risk of tire failure. See the complete line of U. S. Royal "Low Profile" tires—now in 5 price ranges for every make and model car—at your U. S. Royal Dealer.



Excessive flexing pushes the temperature of ordinary tires above 240°F. That's the danger mark. But the lower, wider shape of U.S. Royal "Low Profile" tires reduces flex, keeps tires cooler, even at top highway speeds.

\* "Low Profile" is United States
Rubber Company's trademark for its
lower, wider shape tire.



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NO DRY 'SMOKED-OUT' TASTE!



You can light either end!

See how Pall Mall's famous length of fine, rich-tasting tobacco travels and gentles the smoke—makes it mild—but does not filter out that satisfying flavor!

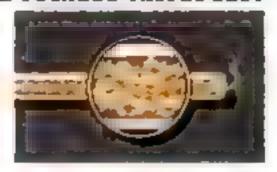
HERR'S WRY SMORE "THAVELED" THROUGH PINE TORACCO TASTES BEST



You get Pall Mail's famous length of the finest tobaccos money can buy.



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Now the Army is working on

### Tanks That Walk and Jump

#### By Martin Mann

AN'S greatest invention is the wheel, but this handy device isn't good enough for the U. S. Army. For the astonishing truth is that an Army design group is working on machines that walk, creep, run, and jump.

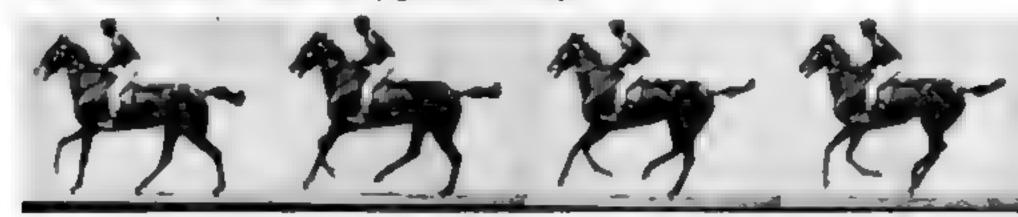
These strange vehicles have legs and feet like animals, and they move like animals. The first model of a machine that walks is now being tested. Others that borrow ideas from horses and grass-hoppers have been designed.

The Army wants legged vehicles be-

cause legs are still the fastest way to cross rough country. The humbling fact is that, while airplanes fly faster than birds and ships swim faster than fish, no ground-supported machine yet built can get over broken terrain as fast as a horse, mule, or donkey.

Perfected, such a machine might have revolutionary effects. Sportsmen, geologists, and surveyors might anap it up to get into rugged back country. Farmers might find it easier on their priceless soil than tractors. Miles upon miles of secondary roads, now maintained at great expense, might no longer be needed—

#### The horse runs with short, graceful leaps



Masterfully engineered for sustained speed, horse stretches its legs to go fast, folds them

with tax savings that are pleasant to dream about.

Military men say there is an urgent need for vehicles that can carry tank-like loads at animal-like speeds. Battles are rarely fought on roads, and great advantages come to the force that isn't tied to a road network. But tanks and jeeps are surprisingly slow once they get off the road. Even on fair terrain the best they can generally do is 10 m p.h., and 5 m.p.h. is more common. Some rocky land and steep bluffs can't be managed at all.

Speedy animals. On a flat track, race horses have hit 38.7 m.p.h. over a mile. Speeds around 30 can be sustained on less-perfect surfaces for some distance. A wild ass has been clocked making an average 30 m.p.h. over 16 miles. An elephant that escaped from a circus camp in the mountains was found 10 hours later 130 miles away.

But more important, legs can go where wheels and track-layers can't. Mountain

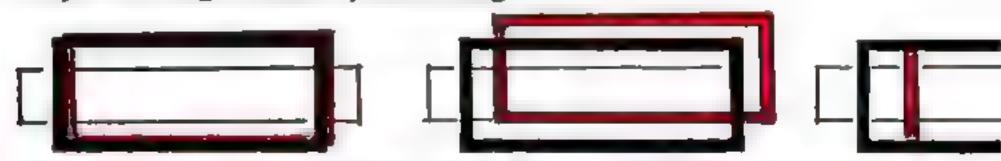
troops all over the world still rely on supply by mules. Kangaroos clear obstacles that would stop a tank.

If nature's designs, perfected over millions of years, are superior, we could be smart to copy them. So the Army hired university researchers to check out legs. There has been no breakthrough yet. But a two-foot-long platform does walk, and some of the weirdest mechanical designs ever conceived illustrate official papers.

Building a horse. Prof. R. K. Bernhard of Rutgers took on running and jumping. Both motions involve leaping, but running (as a horse does it) is a rhythmic series of leaps, whereas jumping (as a grasshopper does it) is made up of individual, nonrhythmic leaps. Professor Bernhard designed fantastic contraptions to imitate each animal

The mechanical horse could be jounced along by a motor swinging eccentric weights. This would make the vehicle bounce rhythmically along the ground.

#### Army's walking machine plods along

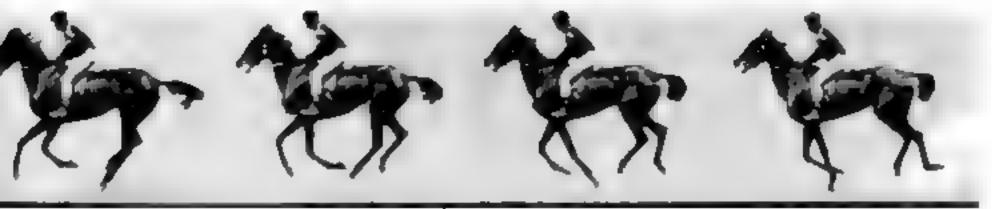


Clumsy gait of model walker is indicated in these diagrams, which follow movement of two

#### Jumping machine was to hop like a grasshopper



Levers modeled after animal legs could jump vehicle across the ground. But shocks of



short to lessen mertial force. Photos are from Muybridge's famous series, shot in 1870s,

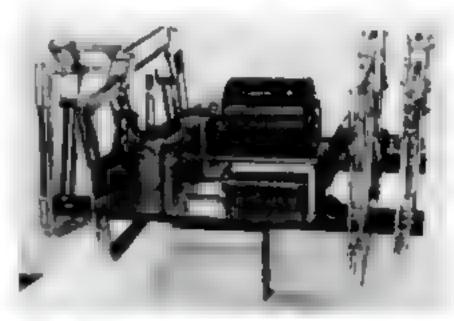
Power unit and crew would ride a softly sprung platform. Unfortunately, the horse machine couldn't hurdle large obstacles. And it couldn't run very fast.

The grasshopper machine. Professor Bernhard's proposal for a man-carrying grasshopper was stranger yet. It was to leap by means of a power-operated pogo stick. This would be an adaptation of a commercial machine called a rammer, used to compact soil in construction work. It has a one-cylinder engine with a tamper fastened to the piston rod.

Professor Bernhard planned to equip a frame with rammers set at an angle, their piston rods linked through levers (equivalent to thigh and leg bones) to pronged "feet." When the rammers fired, the levers would extend to propel the machine up and forward, exactly like a grass-hopper. The machine would land on big air bags to cushion the shock.

The grasshopper machine could go fast (maybe 30 m.p.h.) and jump obsta-

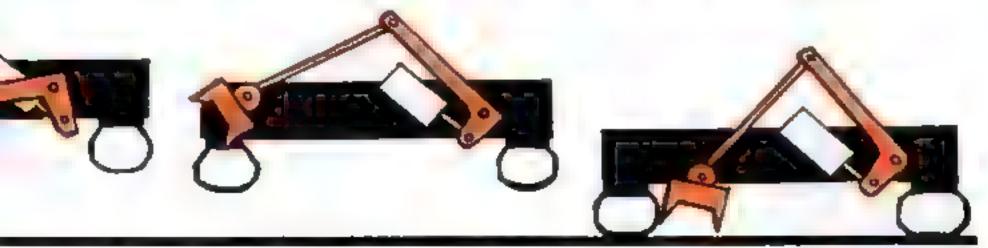
cles. But it couldn't back up easily and might spill if it landed on a rock. More important, the shocks of takeoff and landing threatened to pulverize a crew, and maybe the machine as well. Impact absorption is a major problem; on certain kinds of rough going, a jeep can take



THIS CONTRAPTION WALKS: Complicated linkages move the four legs (open metal rectangles) of working model of Army's walking machine. Motor cranks levers through egg-shaped gears.

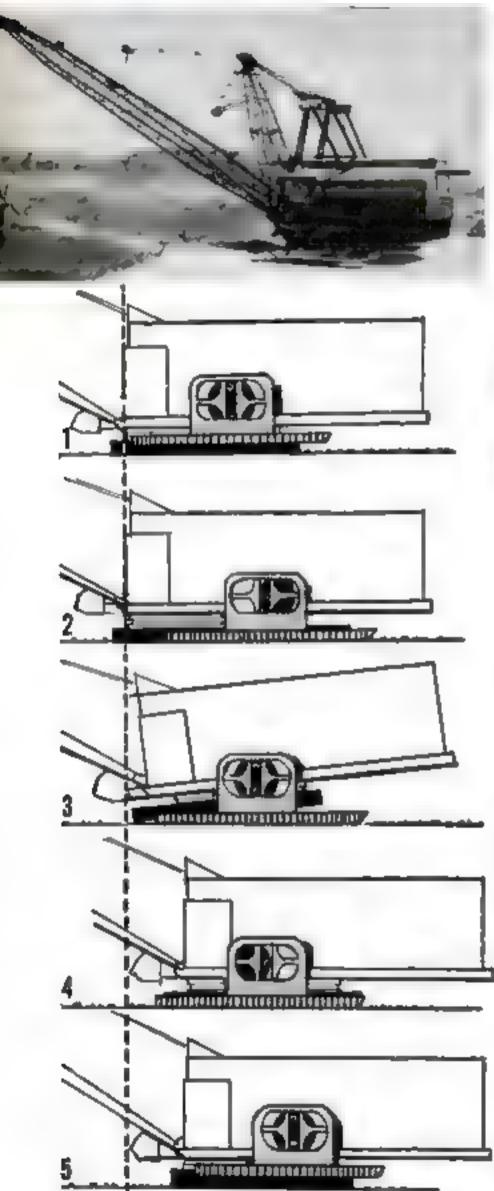


legs on one side of the body. Action is inefficient, but might achieve 20-m.p.h. speed.



takeoff and landing would be too great for a machine large enough to carry men, weapons.

#### These leg-propelled machines are already in use



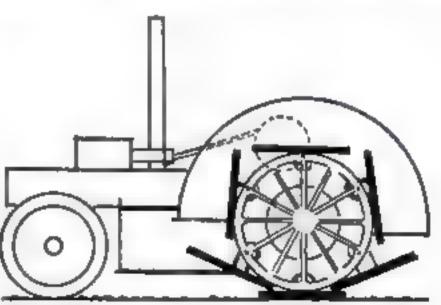
WALKING DRAGLINE, Bucyrus-Erie's huge excavating machine, hitches itself across ground on long feet. It goes backwards only (see sketches). At work (I), feet are off ground, dragline resting on central baseplate. Rotating cam moves feet to right and down (2), tilts body (3), slides body to right and down (4), lifts feet again (5). The monster's top speed: 1/2 m.p.h.



RAMMER, Barco's hopping dirt-tamper, has wide foot fixed to piston rod of a one-lung engine. It jumps 14 inches, 60 times per minute. When tilted, it hops along like a pogo stick.

A 20-m.p.h. walk. After Professor Bernhard filed his report (no models were built), the Army pulled in its reins and decided to try walking before running and jumping. This assignment went to the University of Michigan's Prof. Joseph E. Shigley. He hit upon a contraption that looked as if it might walk: a shuttle linkage used for conveyors. He turned this gizmo upside down and drove it through egg-shaped gears cunningly calculated to eliminate sudden accelera-

[Continued on page 216]



FEET—hinged to wheels, not to legs—propelled this steam tractor invented by Boydell. It was an excellent cross-country vehicle, widely used until the caterpillar tractor replaced it.

#### PS PICTURE NEWS

### Wheeled stadium provides view for two sports

Part of the new baseballfootball stadium to be completed next year in Washington, D. C., will roll on wheels.

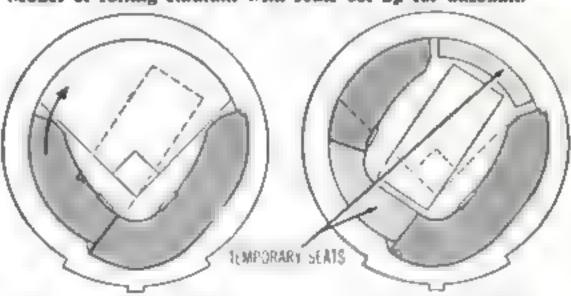
One 400-foot lower grandstand section, including a built-in dugout, will rest on 83 steel wheels 24 inches in diameter. It will reach from the first-base line at home plate to the left-field foul line.

At the close of the baseball season, the section will be pulled by tractors on two tracks—one bolted to the stadium wall, the other buried underground in the outfield. Gaps at the two ends will be filled with temporary seats.

The rolling stadium is being constructed by Osborn Engineering Co., Cleveland, builders of big stadiums: Yankee, Cleveland, Milwaukee, U. of Michigan, among others. It will seat 42,000 fans for the 1961 baseball season, 52,000 Redskin followers that fall,



Model of rolling stadium with seats set up for baseball.



Section rolls clockwise . . . . . . . for football games.

#### Runabout uses VW engine

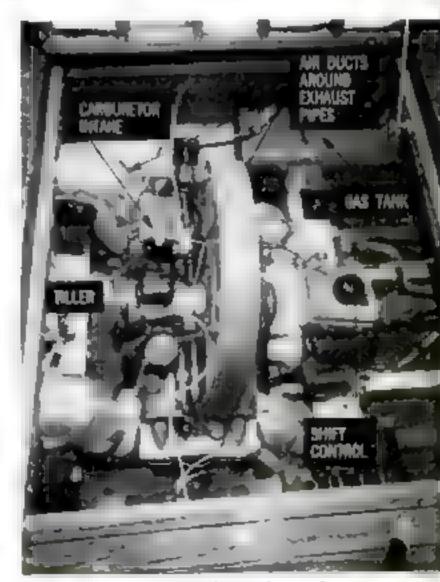


Built especially for the Volkswagen engine, a 17-foot inboard runabout hits speeds up to 25 m.p.h. The Volks-Liner's one-piece hull is made by a German process developed for small planes. It consists of thin birch strips impregnated with a plastic and laminated into five layers.

The 36-hp. VW engine turns the propeller through a Walter's ma-

rine V drive with built-in 1.29:1 reduction gear. Air to cool engine, transmission, V drive, and exhausts is drawn into the engine compartment through an opening under the rear seat. It's blown out through the transom in large ducts that encircle the engine exhaust pipes. Fuel consumption is about 1 8 gallons an hour, giving the boat a sixhour cruising range on one tank of gas.

Volkswagen auto dealers will sell the boat for \$2,495 f.o.b. Dundee, N. Y.



Engine turns prop through V drive.

#### PS PICTURE NEWS





Heets vertical light beam forward onto the road.

tios towered (left), car's frog-eye contour is gone, wind drag is lessened.

#### Frog-eye conversion

This headlight conversion streamlines the frog-eyed Austin Healey Sprite. It consists of upward-facing lamps recessed in the normal sockets. The vertical beams are deflected horizontally by hinged mirrors that are tilted open at night. The lids are moved by a control connected to the light switch. T. E. Killeen, British engineer who made the conversion on his Sprite, contends it cuts daytime wind drag, improves appearance, and keeps the lenses clean longer.

#### For high fliers

This odd-looking altitude chamber simulates 100,000foot heights for testing performance characteristics of solid-fuel ICBM rocket engines.

It was installed by FluiDyne Engineering at Aerojet-General's testing facility near Sacramento, Calif. The tube jutting from the chamber is part of a pressure recovery system. While carrying off hot rocket gases it pumps out air to maintain the low pressure.



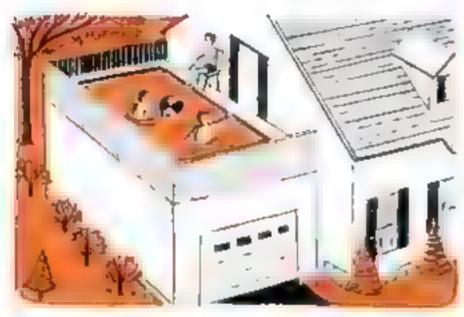
# SINARITE TOO

#### Record-setting outboard

A new world's record for outboards—114.65 m.p.h.—was recently set on an Arizona lake. The photo at left shows the 14-foot prop-walking hydroplane being driven by Hu Entrop of Seattle.

The basic engine was Evinrude V-4 power-head, coupled to a special geared-up lower unit. Gasoline, not racing alcohol, was the fuel used.

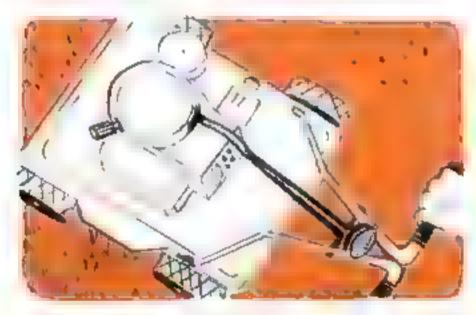
#### "I'd like to see them make..."



ROOFTOP SWIMMING POOLS on garages. Children couldn't stray into them (any exterior miles would be removable) and they wouldn't rob garden space.—Koriun Nigian, Los Angeles.



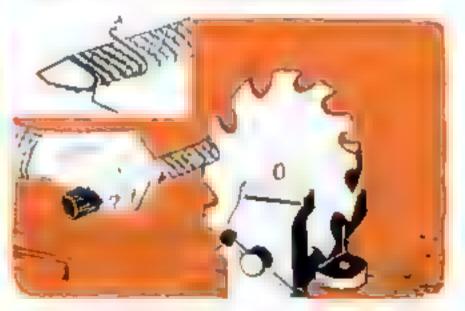
beach or work clothes. Of wetproof paper or thin plastic, they'd be sold by vending machines at gas stations.—R. C. Miller, Santa Monica.



ROTARY-MOWER AIR FILTERS at top of a tubular handle. Placement far from the discharge chute should eliminate clogging and carburetor trouble.—E. Dodd, Middletown, N. J.



THROW-AWAY BOTTLES AND JARS with some salvage value. Squared off like milk cartons, they'd stack to form glass-brick room dividers or garden screens.—S. Levine, Oakdale, N. Y.



A FILE shaped like the guilet on a circular-saw blade. That way you could avoid the nicks and notches that spoil the contour after a few sharpenings.—Carl Bombard, Holyoke, Mass.

Everyone has his own pet idea of a gadget that he would aske to see in general use. The five ideas illustrated above were suggested by Portian Schwell readers. What's

yours? We will puy \$5 for each one published. Please use Government postcards only Write name and address clearly Contributions cannot be acknowledged or returned.

#### NEW FROM EUROPE

#### Eight Feet of Space in a Ten-Foot Car

#### By Harry Walton

RECIPE for packing eight feet of people and luggage into a ten-foot car:

Take a boxy, snub-nosed body. Put small wheels way out at the four corners. Use front-wheel drive and mount the four-cylinder in-line engine crosswise instead of fore and aft.

That's how the British Motor Corporation cooked up the new Austin and Mor-

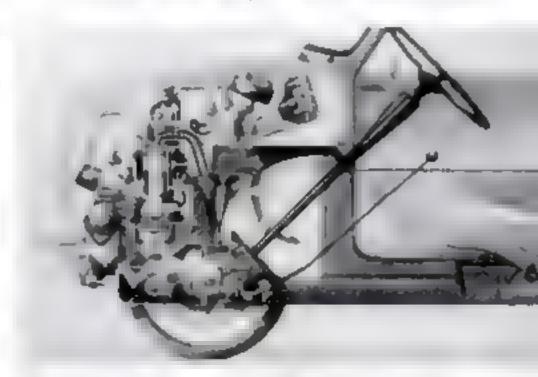
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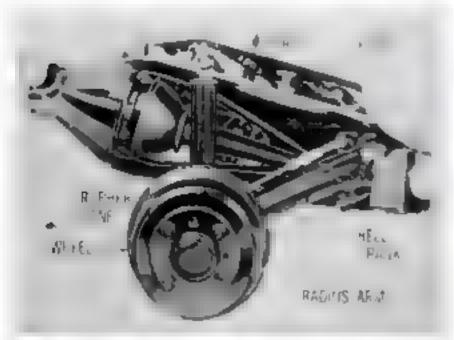
Ten feet short overall, the 850 achieves an



ENGINE IS RIGHT-ANGLED, the radiator in one fender. Air entering the grille strikes the engine and is blown through the radiator in reverse. Exhaust gases emerge from a side vent.



CUTAWAY SHOWS THE TRICK: The crosswise engine is set forward of the front wheels. Built into its sump directly below the crankcase is the transmission, with the differential right be-



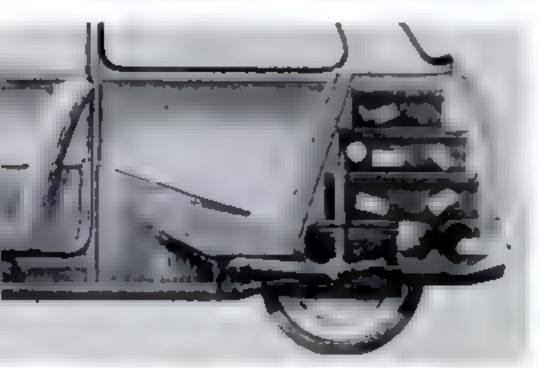
REAR WHEELS SWING on radius arms, which have a short leg forming a bell crank. The wheel load is transmitted through this and a strut to the rubber-cone suspension unit.



saming front windows leave doors free for deep full-width pockets. Instead of a door handle, a cord releases the latch. Missing is a firm handhold to grab on turns.



amazing eight feet of interior load space. The little car will sell here for about \$1,300.



hind it. There is no separate frame. The drive unit is mounted on the front of the body shell, and a rectangular frame with the trailing wheels is mounted on the rear.



WHEELS SO LIGHT you can hold one by a finger make tire-changing almost fun. A single jack socket on each side raises both wheels. The 5.20-by-10-inch tires are tubeless.



FOOT SPACE AND HEADROOM are good. The instrument panel, switches, shift stick, and hand brake are all center mounted. Steering is a fast 21/2 turns from lock to lock.



FRONT WHEELS ARE DRIVEN by swing axles with constant-velocity universals. The front suspension cone, not visible here, is above the top wishbone, inboard of the shock.

# NEW FROM EUROPE The Amphicar: What It's Like to Drive

As I sloshed ahead at 12 knots, I began to see that this thing, half boat and half automobile, had a split personality.





The thing looked simple—too simple, in fact. I found that out soon enough.



First off, I got my gears all mixed-up, and started driving away stern-first.



We splashed into the water. "Throw out the anchor, maybe?" I asked.

#### By Robert Gannon

TVE just driven-piloted an Amphicar—the new little import that rides on land or water. We were introduced to it by Leonard Spiegel, whose company imports them from West Germany.

I climbed over the high door sill and slid behind the wheel. Instruments and controls looked familiar, but there were some additions. Next to the speedometer was a tachometer with an extra scale for propeller r p.m. There was a lever sticking out from under the dash to put the twin propellers in neutral, forward, or reverse. And through the wraparound windshield, I noticed that horn and directional lights were mounted out in the open, on top of the hood and fenders.

Mr. Spiegel and a mechanic hopped in. I fired up the little four-cylinder Austin engine and shoved the floor-mounted shift lever into first. When I let up the clutch pedal the Amphicar promptly backed up. Wrong gear.

"Sorry," I apologized, "I'm not used to driving boats on land,"

"On land," Mr. Spiegel corrected me, "the Amphicar is not a boat—it's an automobile."

I felt around again in the four-speed gearbox. This time I did better. She



Here I was on the briny deep in a car-turned-boat—without a rudder.



lurched forward, engine roaring noisily.

I turned the steering wheel and she spun in a tight little turn like a Jeep. We jounced down a ramp to the water.

I slowed down. "Drive right in," Spiegel directed. He switched to nautical language: "When her stern floats clear of the bottom throw her in neutral and engage the props."

Anchors aweigh. We hit Long Island Sound at a good clip, splashing water in all directions. I half expected the engine to quit, but it was safely tucked away at the rear—oops, stern. We drifted. I began shifting levers. Nothing seemed to work.

Suddenly the propeller-control lever slid into the proper slot. The propellers bit into the water and we got under way.

As we sloshed ahead, pushing a bow wave, a new worry struck me. "Where's the rudder?" I yelled.

"There is no rudder," said the mechanic placidly. "Just turn the front wheels." He was right. With almost as much control as on land, I could swing around sharply. Whether because of her weight or 12-knot top speed, the Amphicar stayed level. We shipped no water.

Gee, this is fun, I thought as I wheeled around in the channel. Nothing to it.

But then a seaplane that had just landed headed across our bow, I tramped on the brake pedal. Absolutely nothing happened. Alarm knotted my stomach as we churned relentlessly toward the plane.

"Reverse, reverse!" someone shouted in my ear. Frantically I jammed the control lever into another notch. The props reversed and we quickly slowed, and then began backing up. I switched to neutral and sat there a moment.

"I'm not used to driving cars in the water," I said defensively.

"In water," Spiegel corrected me, "the Amphicar is not a car—it's a boat."

Making port. I headed for shore—apprehensively. The tide was low, leaving a steep stretch of pebbly beach to negotiate between water and paved ramp.

"When she touches bottom, throw her into drive," the mechanic warned.

We touched and I threw her into drive. "More gas!"

I floored the accelerator. The Amphicar's front wheels jurched onto the beach. She hesitated, and stalled—stuck, half in and half out of the water.

I looked at Mr. Spiegel inquiringly. "You broke it," he said coldly.

[Continued on page 219]



In a near-collision I jammed on the brakes. We kept right on going.



We were half in and half out of the water. It seemed appropriate.

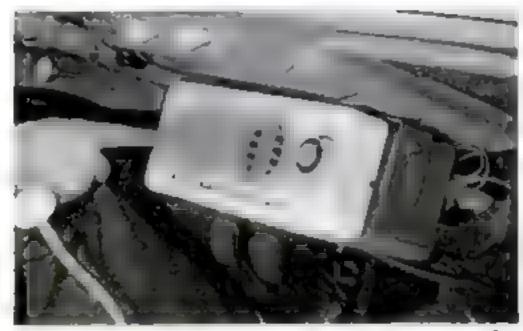
#### NEW FROM EUROPE

Air Conditioning for

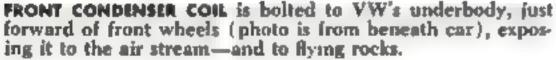
Little Cars

Drivers of imports can play it cool this summer with a unit that takes only 1.6 hp. from the engine

cold Air Rushes Out of two louvered exhaust ports that can be rotated to direct it. Pushbuttons on left control blower speed, Knob on right is thermostat.







One distributor of the Burdco Europa air conditioner—its name in this country—hooked it onto a VW and cooked the car in a heat tunnel until interior heat rose to 85 degrees. At 350 engine r.p.m., temperature dropped to 57 degrees in a half-hour, it was reported. At 2,000 r.p.m., there was a further eight-degree drop in the second half-hour.

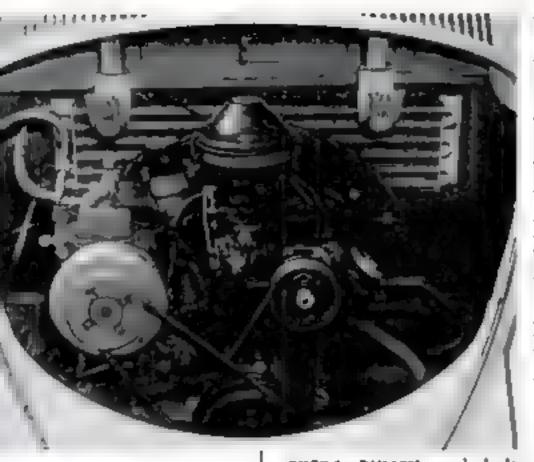
A PS writer (and VW owner) drove the car and reported an abundance of cool air, regardless of engine speed. He did notice a distinct loss of pep when accelerating with the compressor working.

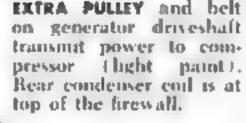
The air conditioners, imported by Alan E. Burden Co. of Houston, Tex., are sold through foreign-car dealers. They will cost about \$350 including installation—which takes one man a day. Mounting brackets come with the unit.

WNERS of VWs, Renaults, or any of 24 other foreign cars\* can now be cool as any Cadillacker. The Bock Co. of Hamburg, West Germany, is prepared to unswelter the little cars with an air conditioner.

Power for the unit comes from an extra take-off pulley on the generator, which is belted to a compressor. In the VW installation, Freon-12 flows from the compressor through plastic tubing to condensers fore (under the body) and aft (on the firewall) where it gives up its heat as it liquefies. Cooled, it now goes to an under-dash evaporator to pick up interior car heat, and from there to the compressor for a new cycle. The maker claims that the unit steals only 1.6 hp.

\*Farious models of Borgward, DKF, Fiat, English Ford, Hell-man, Marcades, NSU, Opel, Pengeot, Porsche, Sanb, Seman, Tannus, and Volvo.





TWO PLASTIC TUBES and a wire run under the car, connecting front and rear units. One tube carries Freon-12 from rear condenser to forward condenser. The other carries Freon vapor from the under-dash evaporator to the compressor. Ware connects the thermostat on the evaporator case to a magnetic clutch on the compressor, When thermostat goes 'on," chitch engages the drive pulley. With thermostat "off," the drive pulley idles.





SMALL BUT SMART, Borgward's new front-drive economy car includes such extras as backup lights, a trunk light, and front-seat backs that lock to protect rear-seat riders in stops. The little car is priced at \$1,795, New York.

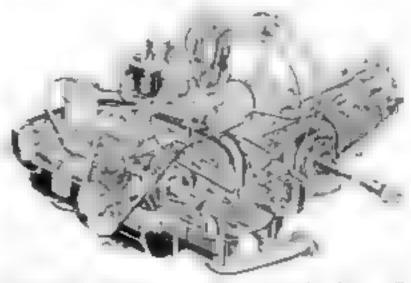
#### Little Fräulein from West Germany...

#### The Arabella

FINNED light-alloy brake drums, an opposed flat-four driving the front wheels, and a four-speed box synchronized in all gears are some of the twists built into Borgward's new economy car, the Arabella. This two-door rides on an 86%-inch wheelbase, 13-inch wheels.

Its water-cooled engine is substantially over-square (2.72-inch bore, 2.36-inch stroke) and is rated at 42 hp. at 4,800 r.p.m. The torque curve is very flat between 2,400 and 4,000 revs. Manufacturer's performance curves show zero-to-50 acceleration in less than 17 seconds, a top speed of 75 m.p.h., and 32½ miles per gallon of fuel at a steady 56 m.p.h.

The car has binnacle instrument grouping, padded dash edges and roof pillars. An under-trunk cradle, releasable from inside, carries a spare wheel.



PANCAKE ENGINE of the Arabella has offcenter fan and radiator. Rear-mounted transmission returns power forward to the swing axles. There is no straight-through drive on the car, even in fourth (top) gear, which has a slight reduction ratio of 1.09:1.

### Television goes underground

A TV camera housed in a plastic bubble tells engineers what's going on in bedrock 150 feet below the surface of the earth.

It's sent down through each of 144 steel caissons that will help form a foundation for the \$100,000,000 Prudential Center skyscraper being built in Boston.

What it sees is reflected on a closed-circuit monitor screen housed, with receiving equipment, in a portable shack that can be wheeled or lifted by crane to each caisson. Its 25-mm. f/1.5 lens reproduces a high-definition picture of 550 to 600 lines resolution—or almost twice as clear as that of the

average home television screen. The scene being televised is lighted by two 150-watt projection lamps mounted be-



some of the 144 caissons, many of them filled with water, through which the camera is sent. Before the television eye took over the job, divers descended—often head first.

side the camera. The assembly is on a turntable that can be tilted 180 degrees or revolved in a complete circle.

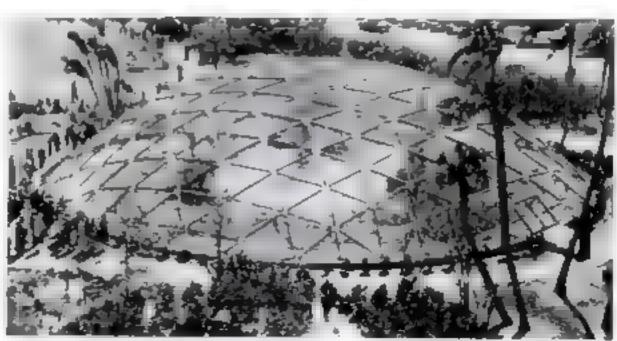


#### Duck returns to water

This float from a World War II Grumman J2F amphibian Duck was bought as Navy surplus by HW. Bandy of Bath, S.C. He made it a fishing boat by installing a Jeep engine. The boat has a built-in trailer: retractable wheels.

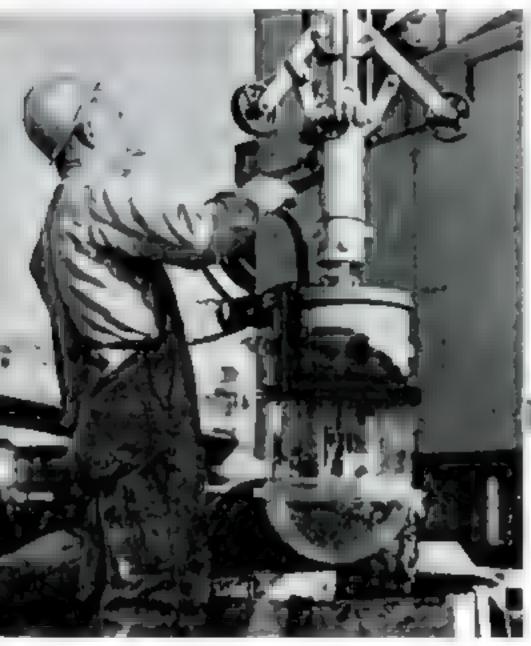
#### Giant gilded bird cage

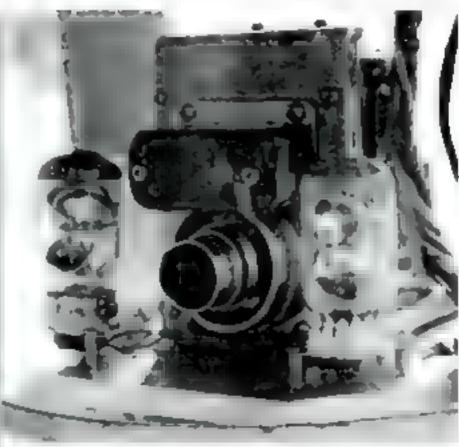
This geodesic structure, 99 feet in diameter and 20½ feet high, is built of gold-anodized aluminum tubing and covered with two-inch aluminum mesh, also colored gold. It's for the birds—storks, cranes, and other exotic feathered creatures—in Busch Gardens at Tampa, Fla.



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#### PS PICTURE NEWS





CLOSE-UP OF TV CAMERA shows lamps mounted at either side to light deep bole. One remains lighted, the other can be turned off or dimmed to prevent reflection or get special effects.

WATERTIGHT BUBBLE is withdrawn at left after TV picture has been telecast from caisson. Wheeled tripod over it rides inside pipe to keep apparatus on steady course and prevent damage.



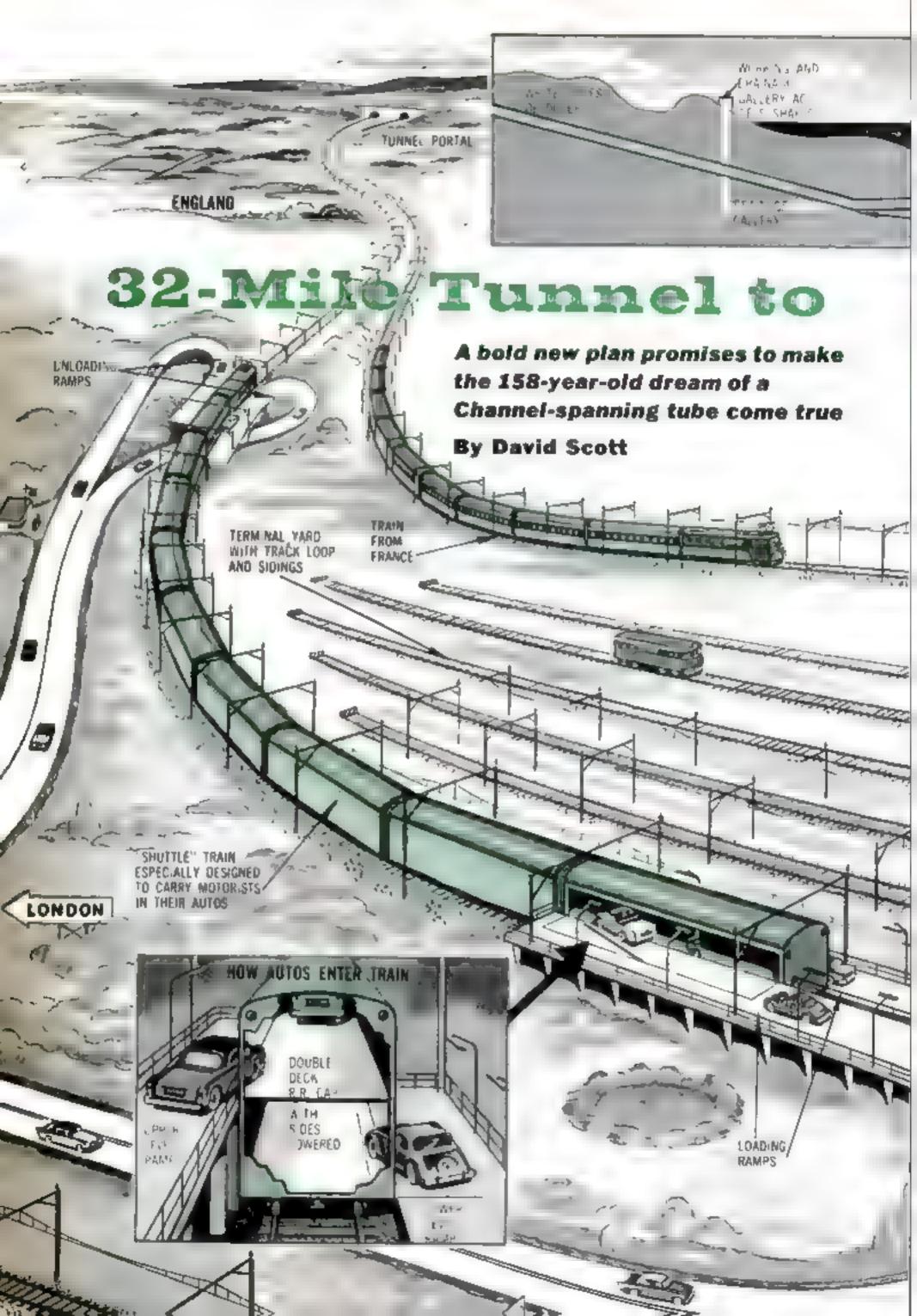
#### Target for rocks

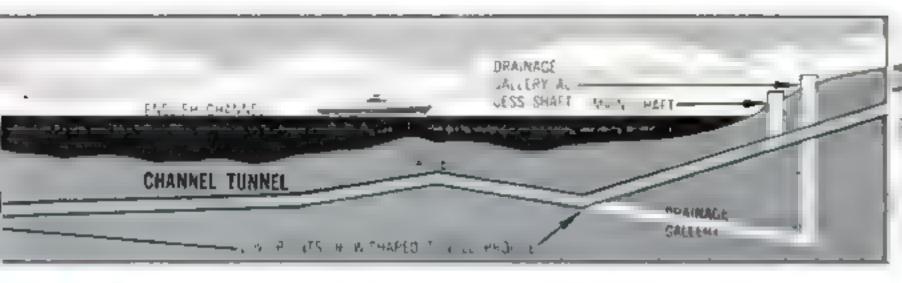
Erected by a real-estate agent on New York's Long Island to catch the eye-and rocks—of passing youngsters, the bull's-eye sign above makes an entiring target. It also saves the firm's nearby advertisement from damage by stoning.

#### Oxygen whiffer

A big drug store on the Champs Elysées in Paris put in the oxygen machine at right to supply quick pickups for tired shoppers. For one new franc (about 20 cents), a customer can inhale 20 quarts of pure oxygen—scented with perfume.









FRANCE





ROM a ramp, you drive right into a railway car at the rear of an electric L train, standing at a terminal near Folkestone, England. You pilot your auto forward through the cavernous interior of the train-its cars are joined by platforms to make a continuous runwayand stop behind the next-earlier arrival. Other autos draw up behind you. Then the train starts, speeds nine miles above ground, and plunges into the most remarkable tunnel in the world.

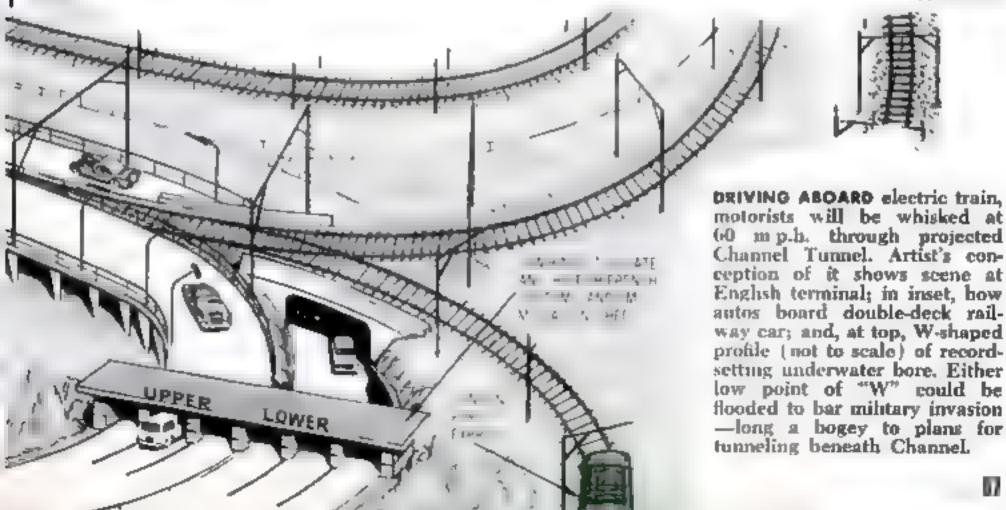
Still sitting in your automobile, you are borne for 23 miles beneath the waters of the English Channel, at an average speed of 60 m.p.h. In less than 45 minutes, the train rolls to a stop. Motorists restart their engines, and you drive off the front of the train to find yourself in France. As you disembark at the French terminal near Calais, you see another line of autos about to board the train for its return trip to England.

That is a preview of high-speed, allweather, comfortable, and inexpensive travel between England and France by 1967, if a startling plan to drive a tunnel beneath the Channel goes through,

At 32 miles from portal to portal, it would be the world's longest passenger tunnel by so far as to be in a class by itself. It would dwarf the Alps' famed 12-mile Simplon rail tunnel, and the seven-mile vehicular tube under construction through Mont Blanc, the present and prospective record holders of their kinds. Its cost would exceed the \$300,000,000 value of the British crown jewels. Like the Great Pyramid of Egypt and the Panama Canal, the proposed Channel Tunnel would rank among the engineering wonders of all time.

Latest of many schemes to link Britain and France by tube or bridge, this mod-

CONTINUED



#### Train-carrying tubes are to be bored full-size by giant

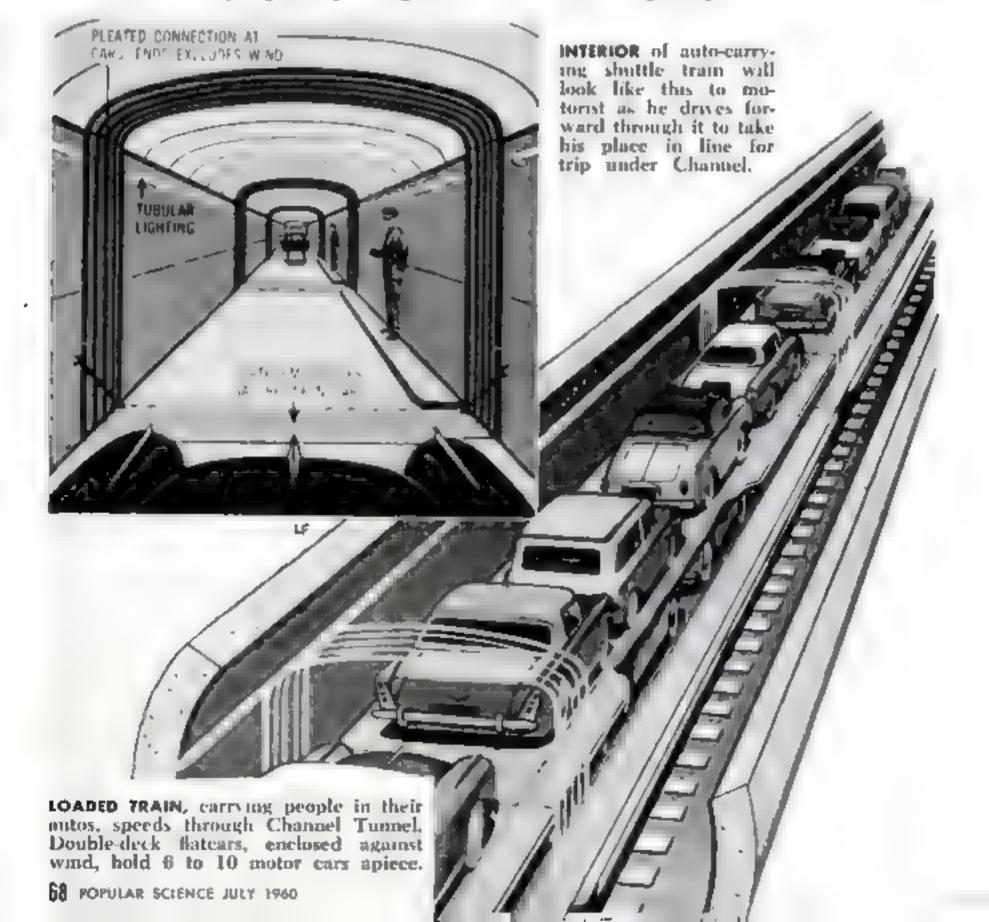
emized plan brings the 158-year-old dream nearer realization than ever before. Calling for a twin-tube rail tunnel, it is sponsored by influential English-French-American interests collectively known as the Channel Tunnel Study Group. With encouragement from high places, they recently submitted their proposal to the British and French Governments, upon whose approval its fate now hangs.

The plan envisages two main tubes running side by side, 97 feet apart, between portals near Dover in England and Calais in France. Bored through the Channel bed, they dip 100 to 200 feet below the sea floor. Each circular tube has an inside diameter of 21 feet 4 inches and holds a single railway track.

Shuttle trains, especially designed to

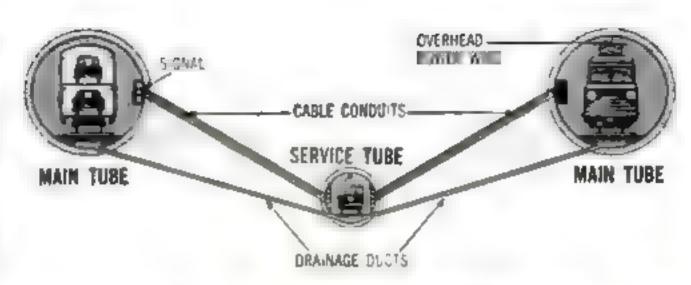
carry motorists in their autos, run through the tunnel at 15-minute intervals, plying the 44-mile distance between the terminals beyond its portals. A loop of track at each terminal turns the train around for the return trip.

While single-deck flatcars may serve at first, the final plan is for double-deckers, enclosed to reduce air drag and shield passengers from wind. Each holds six to ten autos, according to their size. Made up of perhaps 30 cars, the train is loaded at the rear and unloaded at the front, through special drop-sided cars, at two-level ramps. To streamline international formalities, a joint British-French customs and immigration shed is combined with the tollgate spanning the approach to the loading ramps.



#### rotary machines

tach main tust, shown in sectional view of Channel Tunnel, has inside diameter of 21 feet 4 inches and carries electric trains in one direction. Smaller service tube below them provides for drainage and maintenance.



Through passenger and freight trains use the tunnel, too. Express-train passengers speed from the center of London to the center of Paris, via the tunnel, in only 4 hours and 20 minutes.

Each main tube normally carries trains one way. But trains can be shunted from one tube to the other at four crossovers—one at each coast, the others seven miles offshore. Thus a section of either tube can be closed off for repairs or maintenance. At night, when this would be done, trains running back and forth through one tube could handle the light traffic.

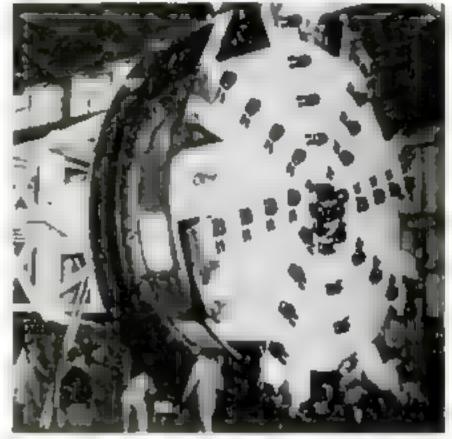
Between and below the main tubes, a service tube about 11 feet across serves for draining them, for maintenance, and as an electric-cable conduit. Cross passages connect it with the others. The service tube slopes downward from mid-Channel to the bottoms of vertical access shafts on each coast. These house elevators, ventilating ducts, and pipes for pumping out seeping water

Fresh air. Since the tunnel is used by electric trains, rather than by motor vehicles gulping air and belching exhaust fumes, ventilation is no problem. Engineers anticipate that the trains themselves, like pistons in cylinders, will aid in circulating fresh air through the long underwater section.

As novel as the rail tunnel itself is the scheme for excavating it. A giant rotary machine with a 23-foot 10-inch cutting head will literally bore the fullsize tube through the Channel bed.

It will eat through a kind of rock ideal for tunneling. As if put there by providence, a 1½-mile strip of firm chalk lines the Channel at its narrowest point. All but impermeable to water, strong enough to need no support after being bored, it still is soft enough to yield easily to a

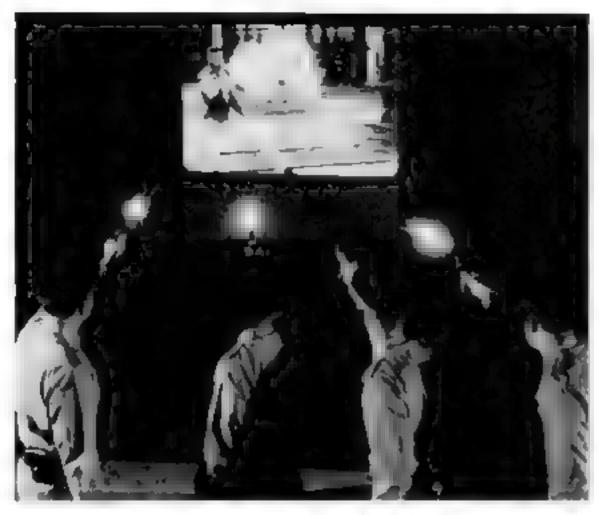
[Continued on page 213]



**HUGE ROCK BORER** like this mechanical mole, used at Oahe Dam in South Dakota, is expected to drive 23-foot-diameter hole for Channel rail tubes at the rate of 1,475 feet a month.



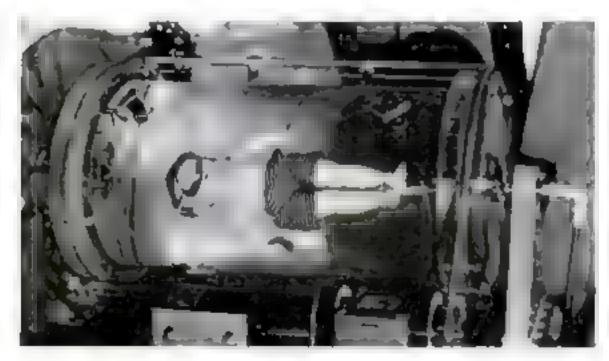
ACTUAL START on Channel Tunnel, in 1880s, produced seven-foot-diameter tube shown in this historic British Railways photo. Early boring machine, ancestor of big modern ones, drove it more than a mile from English side.



#### To shoot or not to shoot

Fighting gun battles with a crook in a color movie keeps Los Angeles police on their toes. Above is a typical night scene on their open-air range. The cope fire live ammunition at a realistic gangster whose shootin' image is projected on a bed sheet 25 yards away. The sheet has to be replaced about once a month.

The point of the film, which runs 20 minutes with accompanying sound, is to teach cadets, patrolmen, and detectives to judge in a flash when to shoot and when to hold their fire. In addition to the supposed crook, the film has a cast of innocent bystanders and a couple of plainclothesmen, who sometimes get in the way.



#### Doll is weightless in water tank

The doll above is floating weightlessly in a scale model of a revolving tank that may soon show how man will react in space. The spinning tank will subject an astronaut to long periods of weightlessness instead of the few seconds now achieved in parabolic plane flight. The experiments are being conducted at Lockheed's Marietta, Ga., research laboratories.

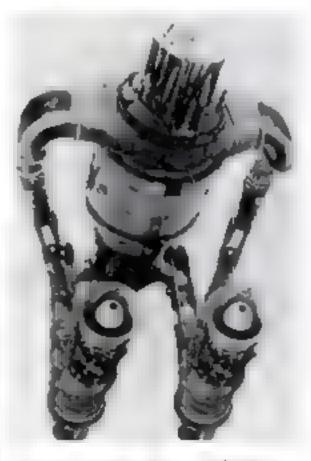


#### Foreign truck

A new, light panel truck is being sold in the United States by France's Renault. It has front-wheel drive, with a 32-hp, engine that can be taken out in less than an hour for bench servicing.

The panel body has sliding side doors and a divided rear door—the lower half on side hinges, the upper

part hinged at top.

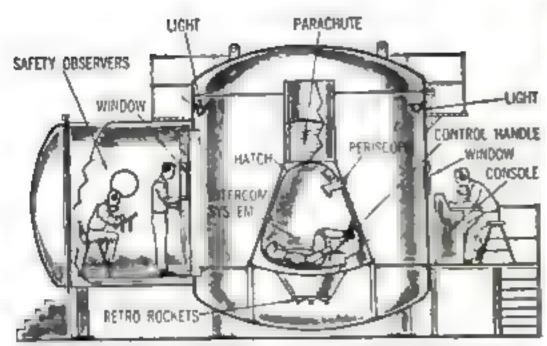


#### A-power for flight

This robot-like device has been tested for 120 hours on the ground, but one day it may fly.

It's a new experimental heat-transfer reactor developed by GE for possible future nuclear aircraft.

The "robot's" body is the reactor. Its two "hands" hold turbojets. Here they look upright; in a plane they would be horizontal.



Altitude chamber simulates space pressure 40 miles up.

### Newest steps toward space

America's astronauts—the men who will be rocketed into space—have taken two more steps toward the threshold of their adventure.

The first of their capsules is ready, and a tank to give them an advance taste of space flight, by simulation, has been built

The actual capsule (right), the first of 20 being built by the McDonnell Aircraft Corp., St. Louis, has a base diameter of six feet and stands nine feet high. The first one will be used in unmanned flights from Wallops Island, Va, to test the pilot-escape system (atop capsule in photo).

The tank (above) will take the astronauts to a "height" of more than 40 miles—without leaving the ground. A mock-up capsule will be lowered into the tank, called an altitude chamber, through a hatch. Lying in it, an astronaut will be connected with the outside world through an oxygen line, an intercom system, and test wires.

Pressurization, or "dive," rates up to 50,000 feet a minute will be like those to be encountered when the capsule returns to earth from space. In an emergency the chamber can drop from 225,000 feet to sea level in six seconds.

Connected to the tank, being built by Tenney Engineering, Inc., for the National Aeronautics and Space Administration, will be an antechamber, to serve as an air lock and observation post.



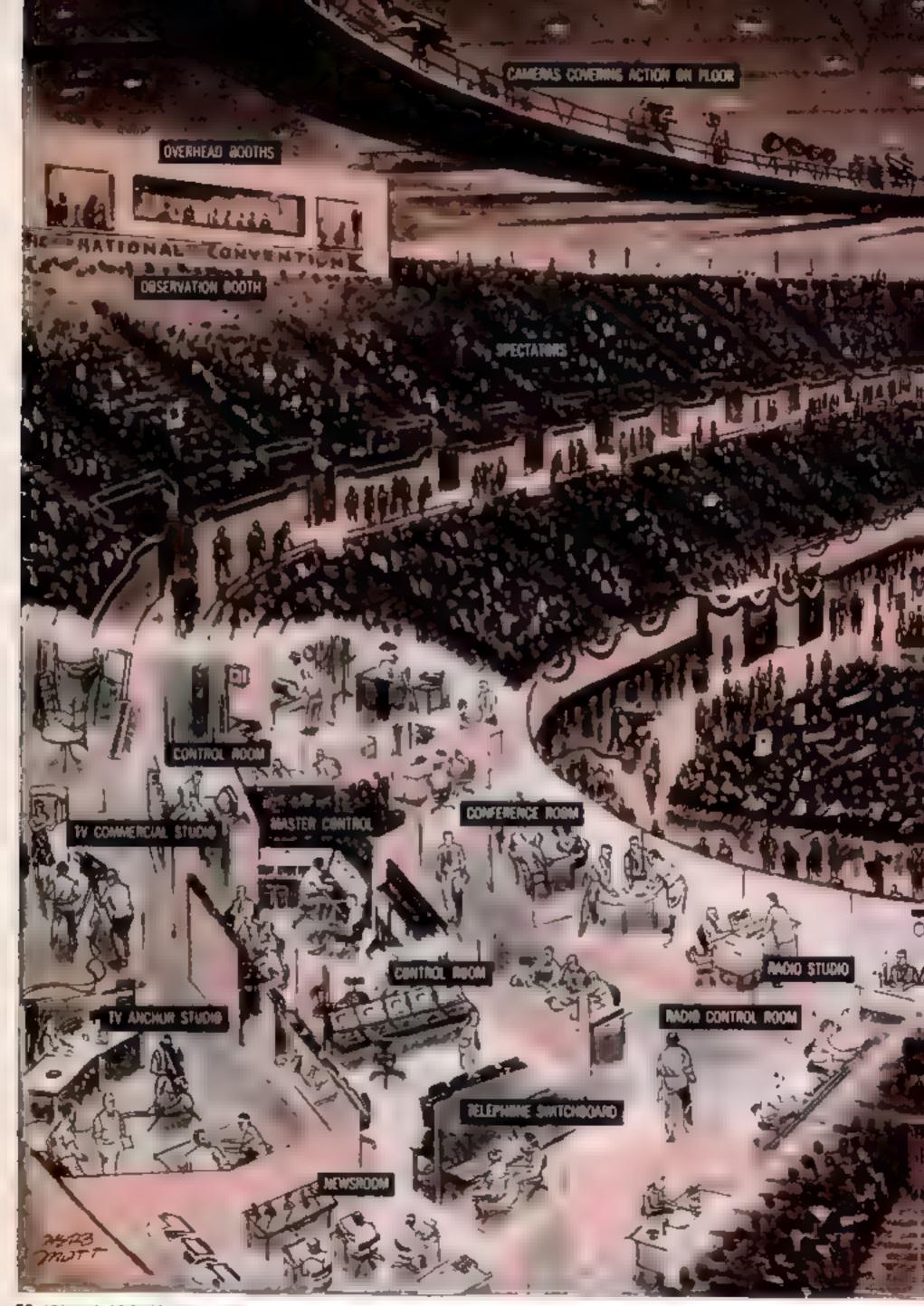
First of 20 actual space capsules.

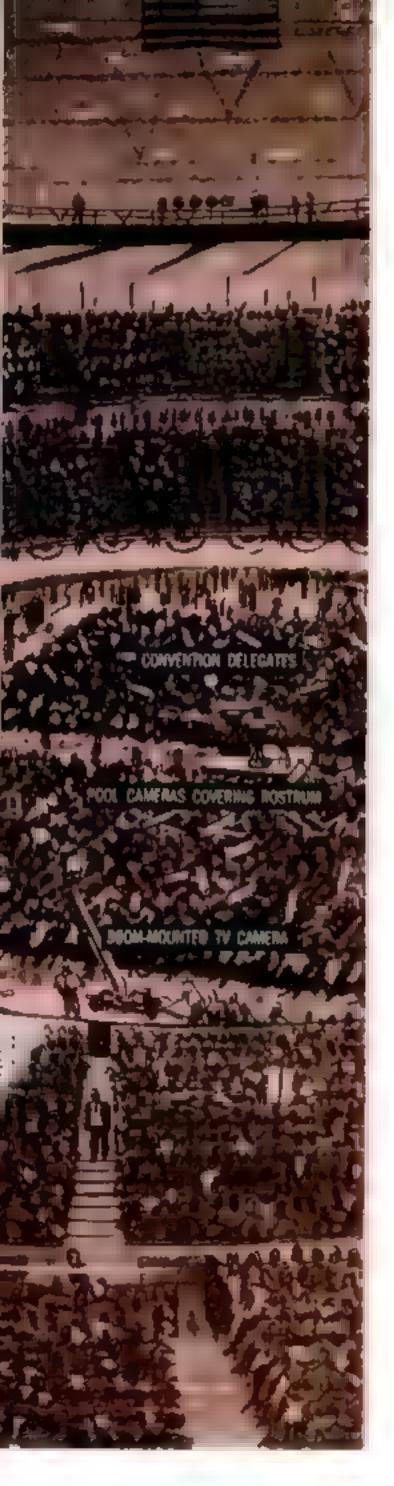
#### Low-cost utility car

Here's the lowest-priced four-passenger automobile made in the United States. It's the Saviano Scat. It sells for \$1,390 including delivery, handling, and Federal excise tax.

The two-door vehicle, designed for work or play, is powered by a 25-hp. air-cooled engine, gets 25 to 30 miles on a gallon of fuel, and has a top speed of 50 m.p.h. Saviano Vehicles, Warren, Mich., makes it also to run on propane for indoor industrial use.







A behind-the-scenes look at how the networks will cover the national political conventions

# 1960's Most Exciting TV Show

TV spectacular of the year: the real-life drama of the national political conventions that will select our next president. And you have the best seat. Straight to your living room, new tricks of electronic magic will bring a clearer and more colorful view of the politicking than even an official delegate sees.

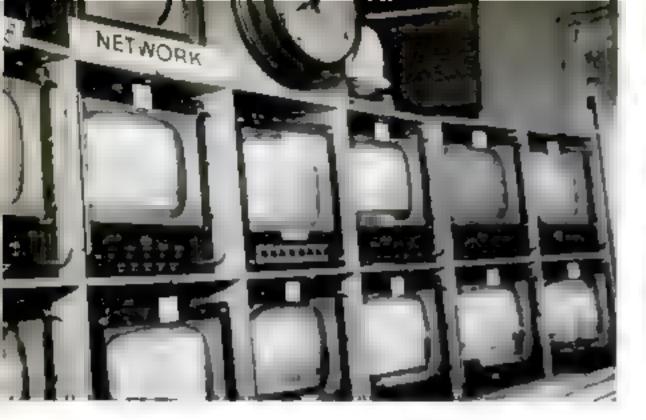
This year the show should be more thrilling than ever. Partly, that's because there's more suspense in the plot. But the TV men have also refined their techniques to catch more action and less routine oratory. Video tape, not available in 1956, will eliminate many dull stretches.

Men and money. The television networks will spare neither men nor money to take you to the political battles. They'll spend several million dollars on these few days of telecasting (and get it back, plus profit, from sponsors). They'll dispatch more than 1,000 men (and a few women) to do the job.

Look at Los Angeles, where the Democrats light their fireworks July 11 in the handsome new Sports Arena. There each network is now finishing an entire TV station all its own (cost, without equipment: \$100,000-plus). The quarters are strictly temporary,



SETTING FOR POLITICAL DRAMA: Democrats convene this month in Los Angeles' modern arena (above). Drawing at left shows CBS facilities; other networks and independent stations have similar metallations. Cameras on floor of hall are shared by all.





DOZENS OF PICTURES coming from cameras all over the city are displayed on monitor screens. Here, director chooses one to be sent out over air.

# Electronic magic gives you a ringside seat to watch the

HELICOPTER CAMERA can bring unusual outdoor views to the television audience. It broadcasts picture to station wagon (antenna on roof) which relays signal to main studio.

and will be knocked down as soon as the Democrats decide on their man. But they don't look temporary.

CBS' work area has 30 rooms, including two studios (the bigger one reserved for Betty Furness and her commercials), one master control, two studio control rooms, a newsroom, and such miscellany as a photographic darkroom, kitchen, mimeograph room, and medical office.

Similar areas are occupied by ABC, NBC, and the pooled facilities of independent stations. NBC alone is putting in more than 25 cameras, 20,000 feet of camera cable, 40,000 feet of telephone-intercom cable, and 14,000 feet of coaxial cable.

That's not all. Each network also has a smaller TV station, only slightly less elaborate, in the Hotel Biltmore, where the Democrats make their headquarters. And more: Mobile TV stations in trucks will catch newsworthy candidates wherever they are, at conference rooms or airport.

Ironically, all these temporary facilities are being installed in a city that is already lavishly equipped for television. There are seven local TV stations (one, KTLA, operates a helicopter-mounted camera that could supply some striking shots). And there are the gigantic sound stages for network TV production in Hollywood, which probably won't be used for convention telecasts at all.

The Republicans, who start their political circus in Chicago on July 25, will get the same treatment: special studios in the Stockyard Auditorium, more studios in the headquarters hotel, and mobile units, all in addition to excellent facilities at the local stations.

Eyes of democracy. These elaborate installations are one part of the massive press machinery that serves a vital purpose in a democracy: informing citizens so that they can vote intelligently.

Cameras and microphones spotted around the convention halls bring you the various philosophies of the candidates, and let you follow the intimate details of crucial votes. But many of the significant decisions are made informally, "off the floor." You'll be in on these, name commentators will expertize from "anchor" positions—large, impressively gimmicked studios. The photos here show NBC operations in 1956; 1960 will look much the same. At right, the reporting team of Chet Huntley and Dave Brinkley analyze one day's convention developments.



## politicians choose a candidate for the world's biggest job

too. Very small, hand-held TV cameras will catch discussions in the corridors, even spy on delegates conferring behind closed doors.

Important as convention business is, much of it turns out to be dismally dull—boring tallies, one by one, of

1,500 delegates; hours of overripe speeches.

The job of holding your interest belongs to the director at the control console. He must select from dozens of scenes—all showing simultaneously on monitors around him—the one to send through the air to your home. To help him, a communications network worthy of an army deployed for battle—telephones, teletypewriters, two-way radios, and plain old-fashioned runners—alert him to what's happening where.

But sometimes nothing exciting is going on. Or worse, two things are happening at once. Or most disappointing of all, the thrilling scene comes up so suddenly that it's over before the mechanics of switching it onto the air can be completed. Here, the magic of video tape, which instantly records sight and sound for tele-

casting later, comes to the rescue.

TV men recall sadly one frustrating incident during the Democratic convention of 1956, before tape. The cameras caught crucial by-play—one party wheel frantically signaling another—that switched votes to put a candidate right out of the race. The drama of political leaders reaching an agonizing decision vibrated from close-ups on the monitor screens. But the tense scene could not be put on the air fast enough.

In 1960, video tape will be ready to capture such historic instances so that the whole world can see. Mainly, though, tape will record interviews, informal meetings, and interesting sidelights. They will be telecast when the formal business of the convention slows

to a deadly creep.

This combination of marvelous machinery, costly planning, smart presentation, and plain hard work will bring you a clearer insight into the strange process by which America chooses the man for the biggest job in the world. It may help you decide how to vote. It's sure to be fun to watch.—Martin Mann.



DIGHTWEIGHT CAMERAS take pictures for TV audience anywhere the cameraman can get to. Portable radio transmitter-receivers keep crews in touch with directors in control room.



1. CRANE DROPS CAR in Amero's demonstration escape. Ordinarily windows are shut, and he

carries no special equipment to help him in the stunt at the Miami Scaquarium.

## Escaping from a car that sinks under water

When a car plunges into water, one of the biggest dangers to its occupants is panic, according to Philip Amero, a Miami skin diver. Frenzied efforts to escape are a major cause of drownings.

Amero, who stages escapes at an aquarium, says that occupants should not exhaust themselves trying to force open a car door until inside and outside pressures are equalized. This occurs after a few seconds as the car fills with water



4. WATER PRESSURE at first shuts door tightly. Later, trapped air may blow out glass, as here.



#### tural members, control surfaces, overlapped and multilayer sections, and critical welds—without

having to lay up a plane by dismantling it.

#### Aircraft doctor uses X-ray

An X-ray eye is turned on both private and airline planes by engineers at the Lockheed Aircraft service base at New York International Airport.

Using newly developed mobile field equipment, they can inspect struc-

#### PS PICTURE NEWS



2. PANICKY MOMENT is when torrent of water pours in. He advises: Grip wheel calmly.



3. HOLDING BREATH as water climbs over head, he waits until inside pressure equals outer.



5. HAND ON ROOF, Amero braces himself as he pushes out of the sunken automobile.



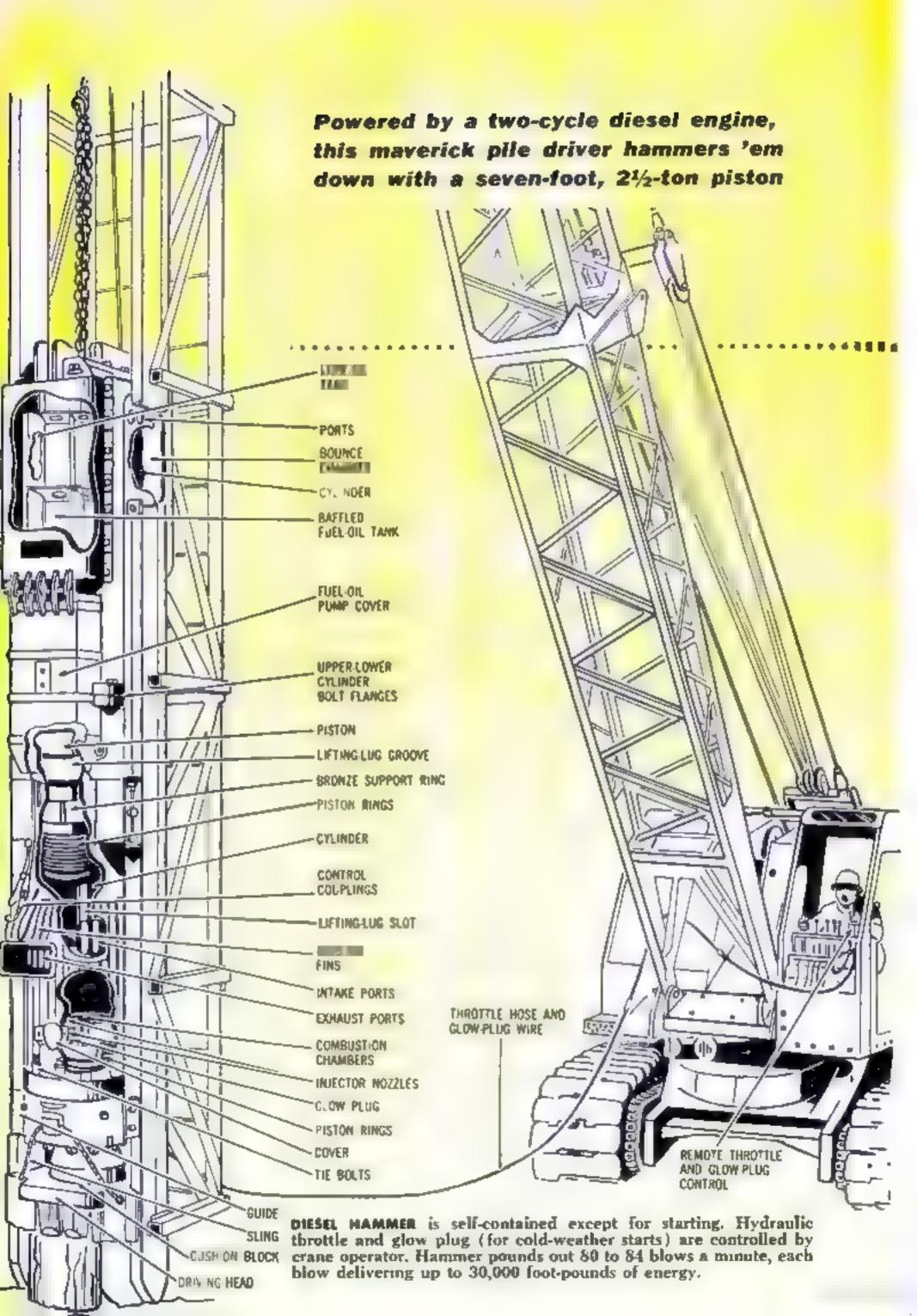
NOW COMPLETELY FREE, he gets clear of car.
 Underwater action takes place in seconds.

#### Motel movies

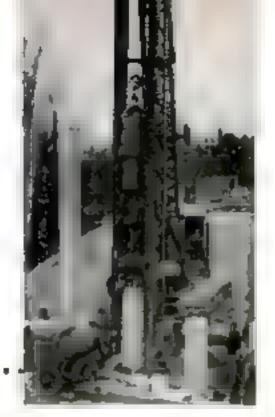
Free movie shows are thrown in when you stop at the Greenland Theatre Motel in Machias, Me.

The motel, shaped like a shallow V, over-looks a drive-in movie. A picture window in each room faces the screen, and there's a loudspeaker on the wall to bring you the sound.





# Diesel Pile Driver Strikes 80 Blows a Minute



HERE is a strangely different sound on construction projects these days: the metronomic "bark-bark" of a new kind of pile hammer.

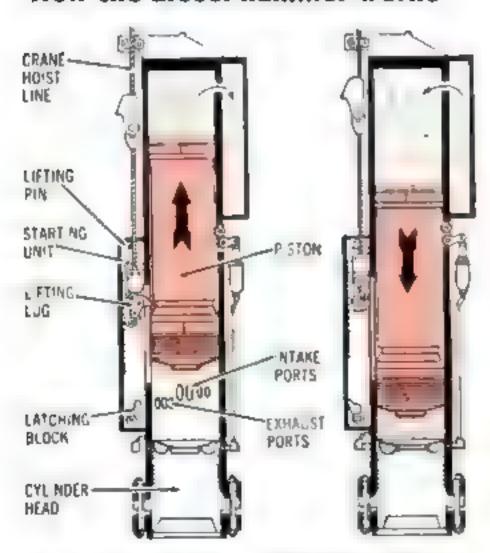
The new device is a diesel engine hammering out a challenge to steam—just as diesel over the years has challenged the right of steam to power tractors, locomotives, huge shovels, and cranes.

But this engine is diesel with a differ-

ence. The way it works is enough to drive a diesel bug mad. Its cylinder head is loose. Every time it fires, the piston hits the cylinder head. The "flywheel" is pretty much just hot air.

An 18-inch-diameter piston, running up and down in a 12-foot-long vertical cylinder, acts 1) as a piston to compress air until it heats up enough to ignite a charge of diesel fuel, and 2) as a huge

#### How the diesel hammer works

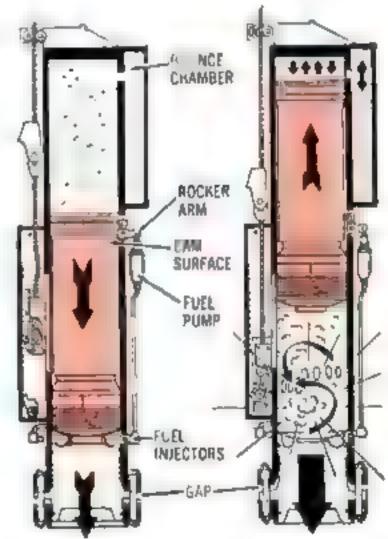


starting unit is cocked by dropping it on latching block. This exposes lifting lug, which engages groove on piston. Crane hoists piston. Entire hammer can be lifted with uncocked starting unit.

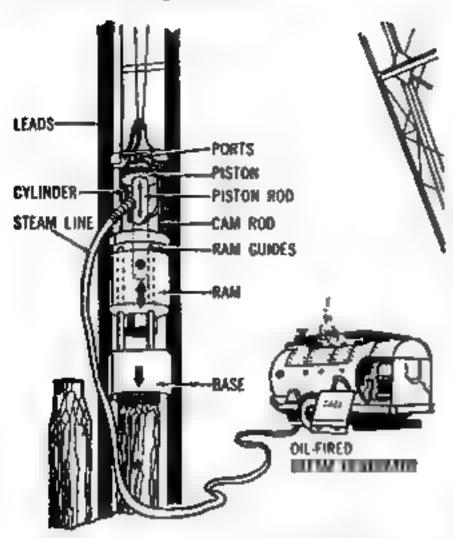
THREE-STEP CYCLE begins as starting unit trips, allowing piston to drop. Air—trapped as piston closes exhaust ports—compresses, preloading pile. Compression also creates heat that will explode the fuel.

IMPACT when piston strikes cylinder head puts pile in motion by breaking static friction between earth and pile. At instant of impact, fuel is injected into dual combustion chambers by camoperated pump.

shoots piston up cylinder, drives pile farther down. (Cylinder head is free to move about 1¼".) Air compressed above piston forms cushion to slow recoil and accelerate piston's return stroke.



#### How conventional pile hammers operate



SINGLE-ACTING HAMMER valves steam or air under piston to raise ram. Cam opens cylinder at top of stroke, allowing ram to drop. Both single- and double-acting hammers use steam or compressed air for their power.

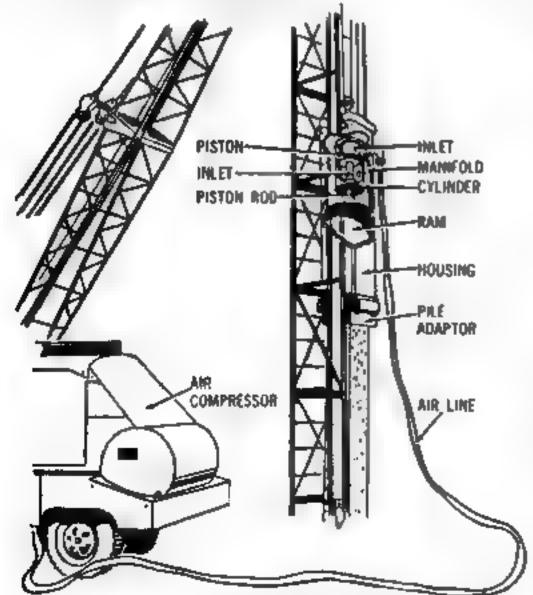
ram that strikes the cylinder head 80 to 84 times a minute.

The cylinder head doubles as an anvil that relays the tremendous blows to the pile. Combustion energy is not transmitted to a crankshaft (there is none) but to the cylinder head and piston,

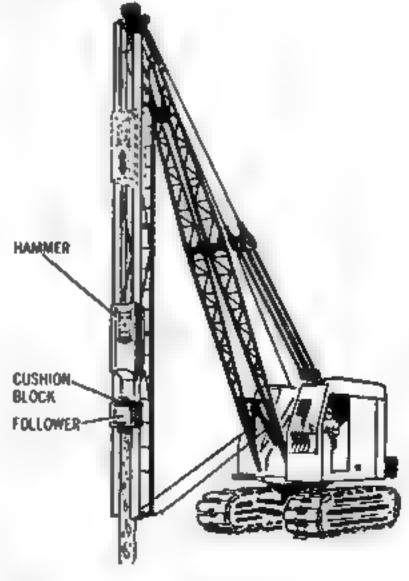
The "flywheel" is an air chamber. When the engine fires and the piston recoils up the cylinder, it compresses air in an enclosed "bounce chamber." This air cushion alows the piston at the end of its stroke and gives it a boost on the trip back down the cylinder.

To start the giant engine, the crane operator positions the unit over the pile and works a remote throttle. A man on the ground pulls a lanyard to cock the starting mechanism. The crane hoists the piston, which is dropped mechanically from the top of its stroke to begin the firing cycle. Guided by the leads, the hammer follows the pile as it inches blow by blow into the ground. Firing and shutoff are controlled by the crane operator.

Link-Belt Speeder Corp., a Cedar Rapids, Iowa, crane and shovel manufacturer, builds the unique pile hammer.— Phil McCafferty.



DOUBLE-ACTING HAMMER valves air or steam under the piston to raise ram, on top of the piston to drive ram down. Differential double-acting type uses a two-stage piston to increase speed on the upstroke.



**DROP HAMMER** is simply a huge cast-iron block weighing 500 to 3,000 pounds, grooved to slide freely in vertical leads. It is hoisted and dropped by a grape.

#### Roll-up doors

The lumber-hauling boxcar at right was built by Southern Railway for quick loading and unloading by fork lift. Each side consists of doors made of horizontally hinged 21-foot aluminum panels that roll into the top. The post can be removed and side stakes dropped into the floor for a full-length opening.



Powerful electric magnets on the side of the pier in the photo bring this excursion boat safely into port on Alster Lake at Hamburg, Germany. The magnets exert a pull of six tons on the little ship.

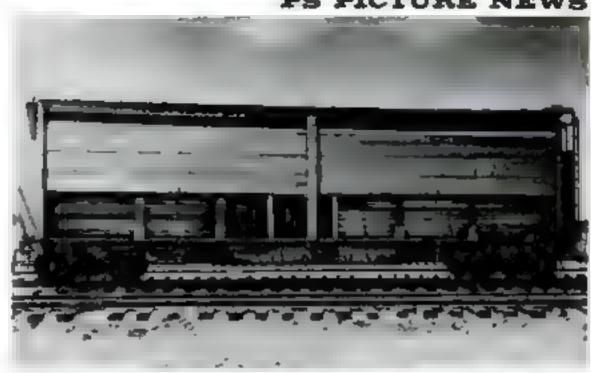
#### **Modern Quonset**

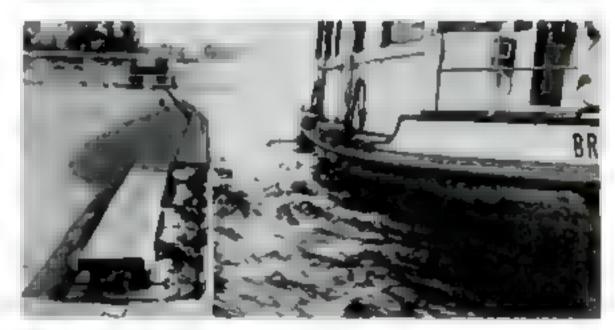
Quonset huts of World War II fame have gone modern; they're being made of fiber-glass. This one, 50 feet long, serves as a Navy field-communications center.

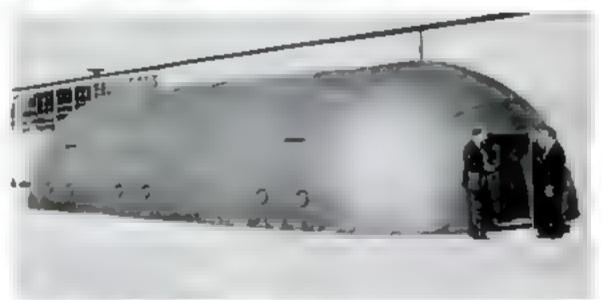
It's assembled of interchangeable locking sections made by Specialty Electronics, Syosset, N. Y. Four men put one up in an hour dismantle it in 10 minutes.

#### Unique Corvette

An experimental Corvette is being exhibited at automobile shows. Known as the XP-700, it is just a wisp more than 48 inches high and has a transparent passenger canopy topped by a periscopic rear-view mirror. Fender air scoops give added brake cooling. It's seven inches longer than the regular Corvette but mainly uses the standard chassis.









# Mechanical Crab to Search Ocean Depths

With an arm 2,000 feet long, TV-camera eyes, and a claw that can clamp onto a 2½-ton load, the giant robot Solaris is a treasure-hunter's dream come true

By Devon Francis



working mooth in photo above shows propellers for maneuvering, claw for grasping, and octopus-like body that houses electric motor to power both. Prototype will descend 650 feet, far deeper than human divers; later versions of Solaris will go down into the ocean as deep as two-fifths of a mile.

Sound will drop overside, on a couple of cables, one of the strangest contraptions ever lowered to the ocean's depths. On its top will be a brace of propellers, at its middle a sphere, at one side a television camera flanked by lights, and on its bottom a claw.

The thing will be called Solaris. It will be the underwater

treasure-hunter's dream come true.

Imagine sitting high and dry on the deck of a boat, and having at your command an arm more than 2,000 feet long to pick up whatever suited your fancy from the ocean floor—plus eyes to scan thousands of square yards of it.

Now under construction in Silver Spring, Md., for experimental torpedo recovery for the Navy, Solaris will be unmanned. In prototype, it is designed to descend to 650 feet, but it can be adapted to go down as far as two-fifths of a mile That's 1,750 feet below the average safe working depth of a human diver.

Solaris is designed to do everything that a human diver

can do, and more.

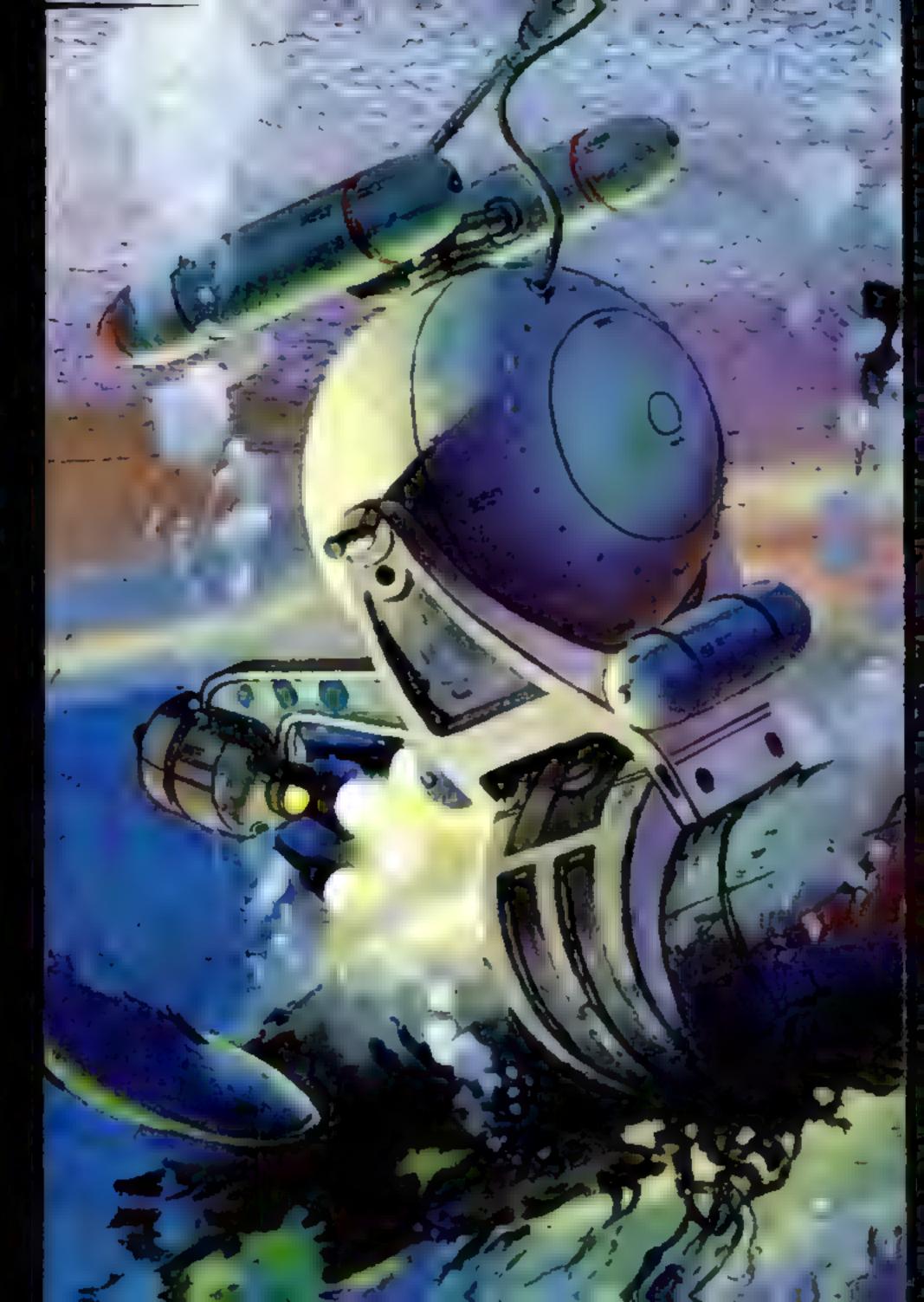
The propellers are for maneuvering. The sphere is the power unit. The TV camera gives underwater eyes to an operator aboard the launching ship. The claw is for retrieving anything that the operator wants on the ocean bottom—including sunken treasure.

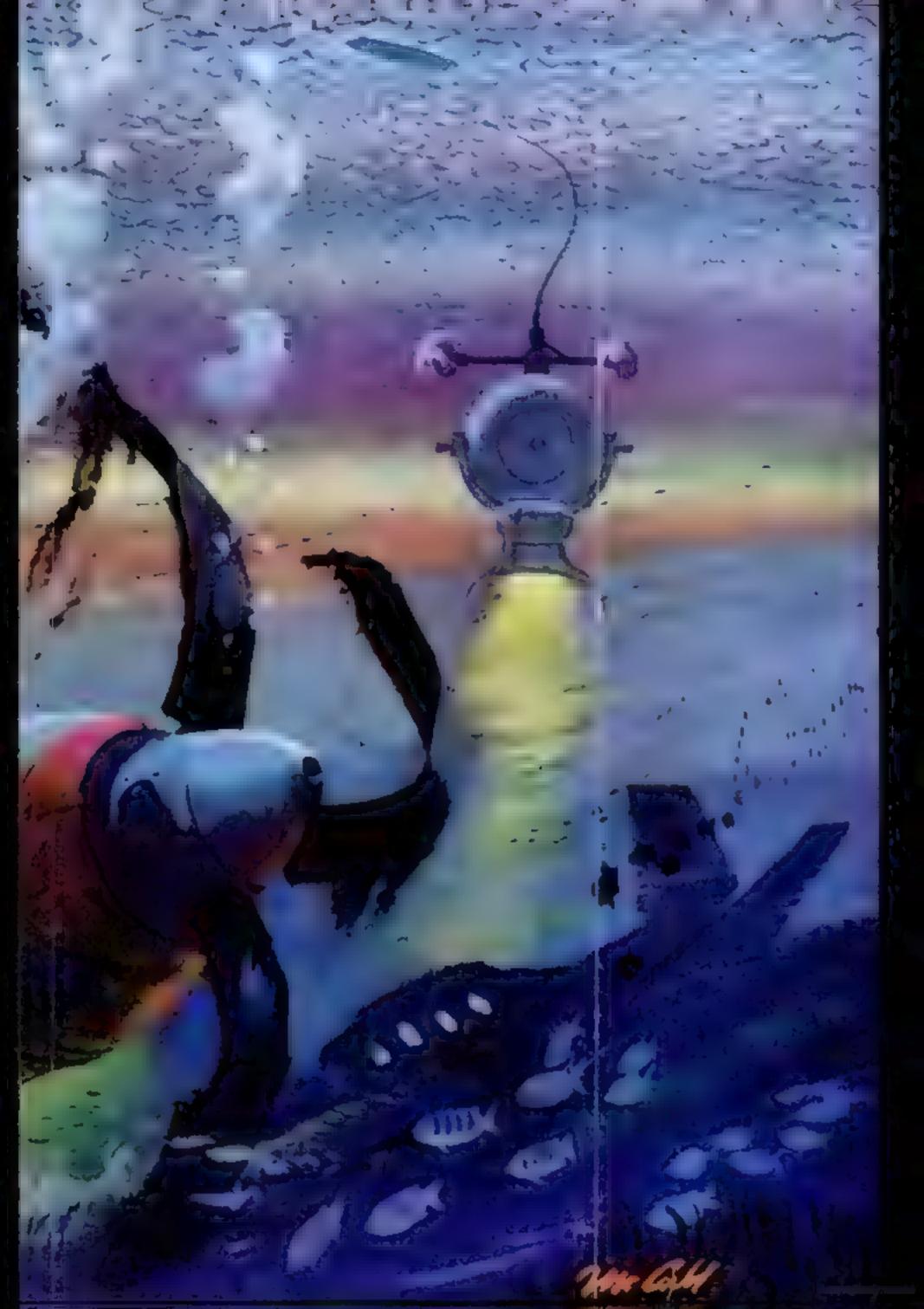
Solaris (Submerged Object Locating and Retrieving/ Identification System) is versatile. It can go exploring, covering 1,400,000 square yards of ocean floor at a depth

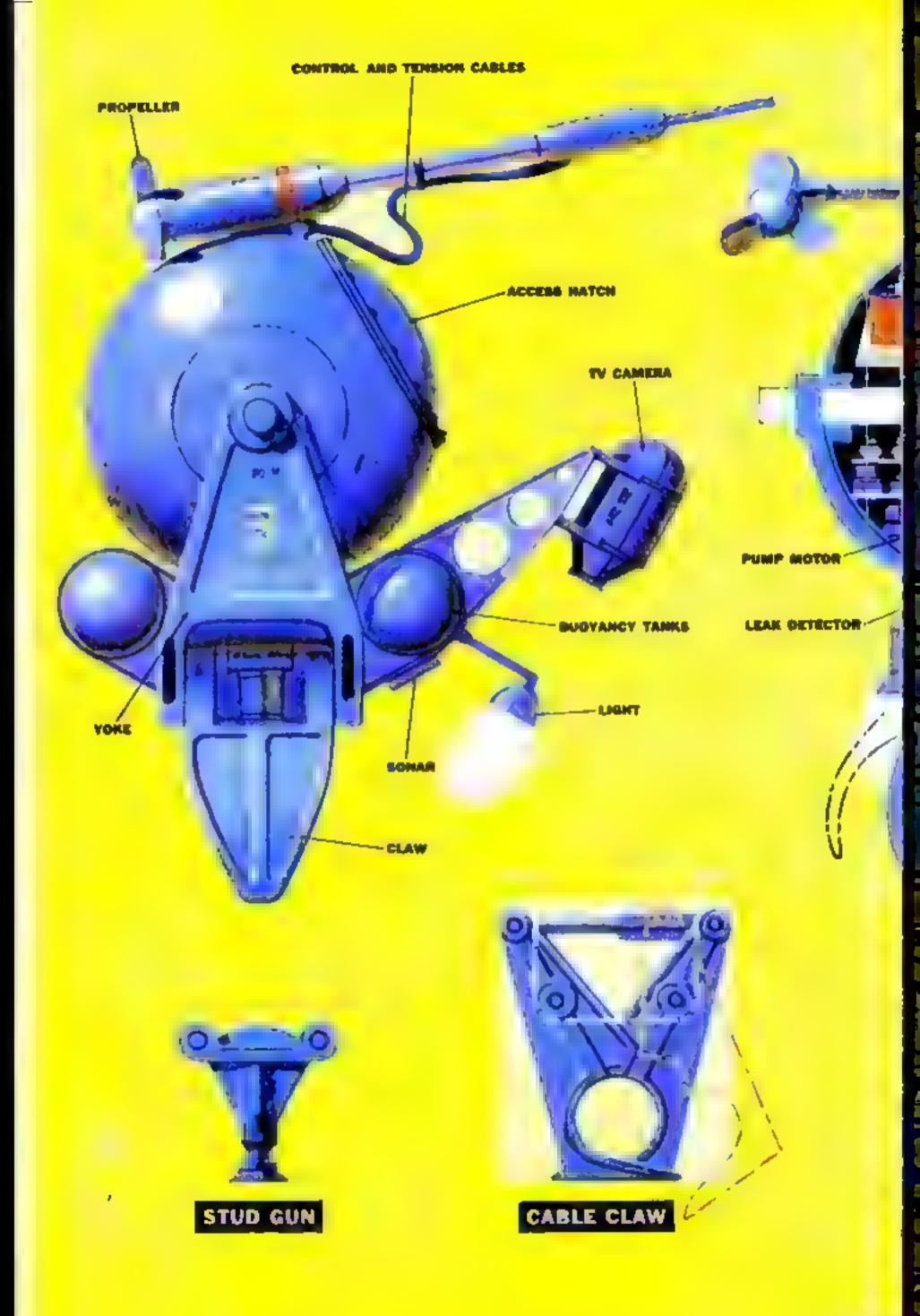
of 2,000 feet.

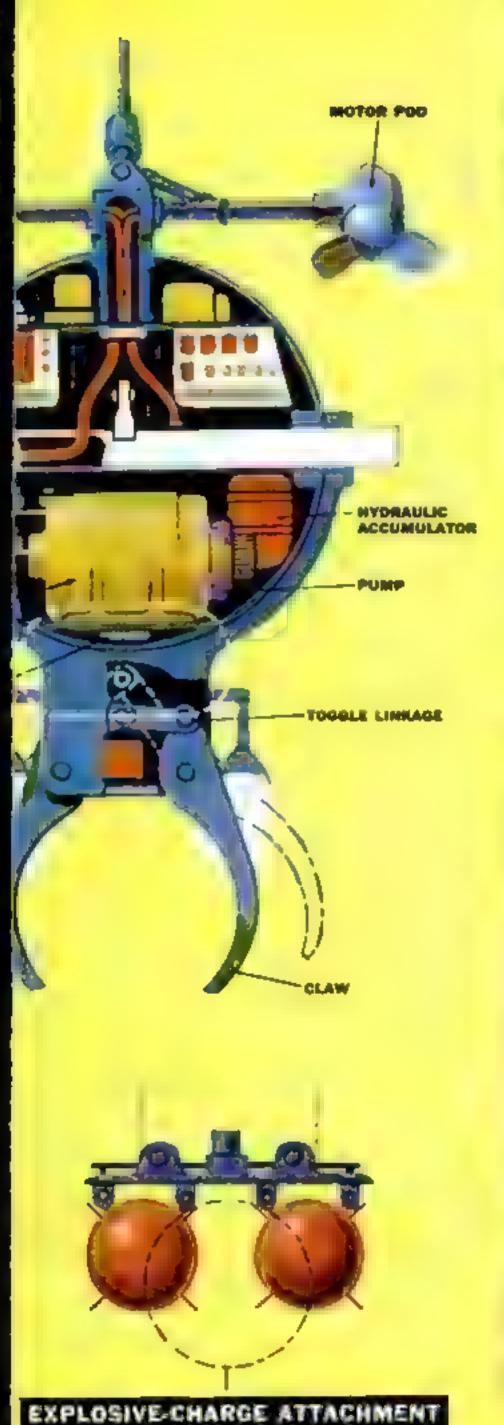
It can perform such prosaic tasks as inspecting channel bottoms, ship keels, bridge pilings, and submarine cables. It can clamp and bring to the surface objects weigh-

PAINTING IN FOLDOUT AT RIGHT depicts Solaris at work salvaging a wrecked plane—one of its many possible missions. See reverse side of foldout for Solaris' various components and how the huge robot will be controlled from operator's console on the surface.











consols on ship has controls for maneuvering and claw movements. Operator uses TV image for manipulations, Instruments show vehicle heading, depth, height above bottom, claw position, propeller r.p.m., light intensity, cable paid out, and power supply.



by cable from one drum, while electrical cable, to minimize strain on it, unseels from another. The two cables are automatically faced together by nylon cord as vehicle descends unlessed as they are winched hope.

ing as much as  $2\frac{1}{2}$  tons. It can place explosive charges, and then back off and detonate them.

One of its possible uses is recovery of pieces of rockets fired from Cape Canaveral and destroyed in flight because of deviation from course. Skin divers have to do this now.

The Vitro Corp., which is building Solaris to specifications outlined by Jack Green, project engineer at the Naval Torpedo Station, Kevport, Wash., knows it can perform all these duties because a preceding device already has demonstrated it. What might be called the daddy of Solaris was developed, also, for the Navy. Its missions are classified.

One of the two cables is the lifeline of the snoopy Solaris. This cable lets it down and pulls it up. Solaris' second cable is its nervous system. Through this, the operator topside issues commands for the thing to crawfish this way and that, to rise a bit or descend, to clamp onto a prize, to drive studs into steel plating, or to plant explosives.

The second cable also carries current for lights that illuminate the inky reaches of the deep, and it transmits the TV signals to a screen so the operator can see what he's doing.

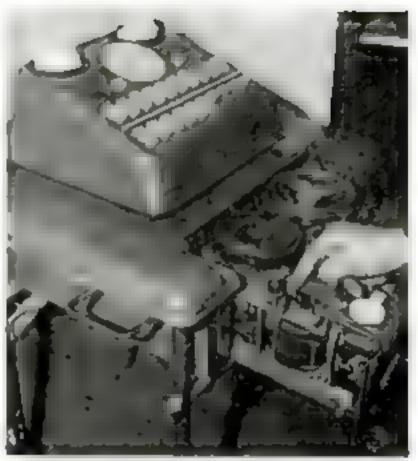
Sitting at a console, the operator taps the second cable for information on heading, depth, height above bottom, propeller r.p.m., amount of illumination, and what Solaris' claws (or one of its substitute fitments) are up to.

That second cable, carrying the electrical lines, must be strong enough to take some tension, yet flexible enough to bend and twist while the vehicle is scrounging around on its boggle-eyed missions.

The sphere (a sort of octopus body inside Solaris' working ganglia) houses a 10-horsepower electric motor. It turns a hydraulic pump that supplies power not only for propulsion but also for the claw. To keep everything shipshape, the watertight sphere contains a leak detector and depth-measuring sonar.

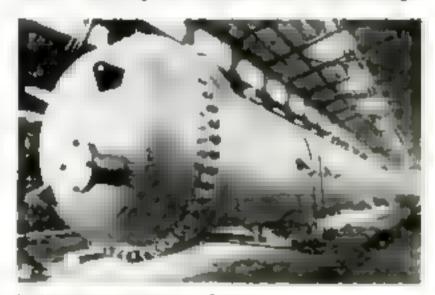
How it works. To maneuver the vehicle, the operator has only to turn on the propellers and vary their speed. They are driven hydraulically through gearing that is essentially like an automobile differential.

[Continued on page 218]



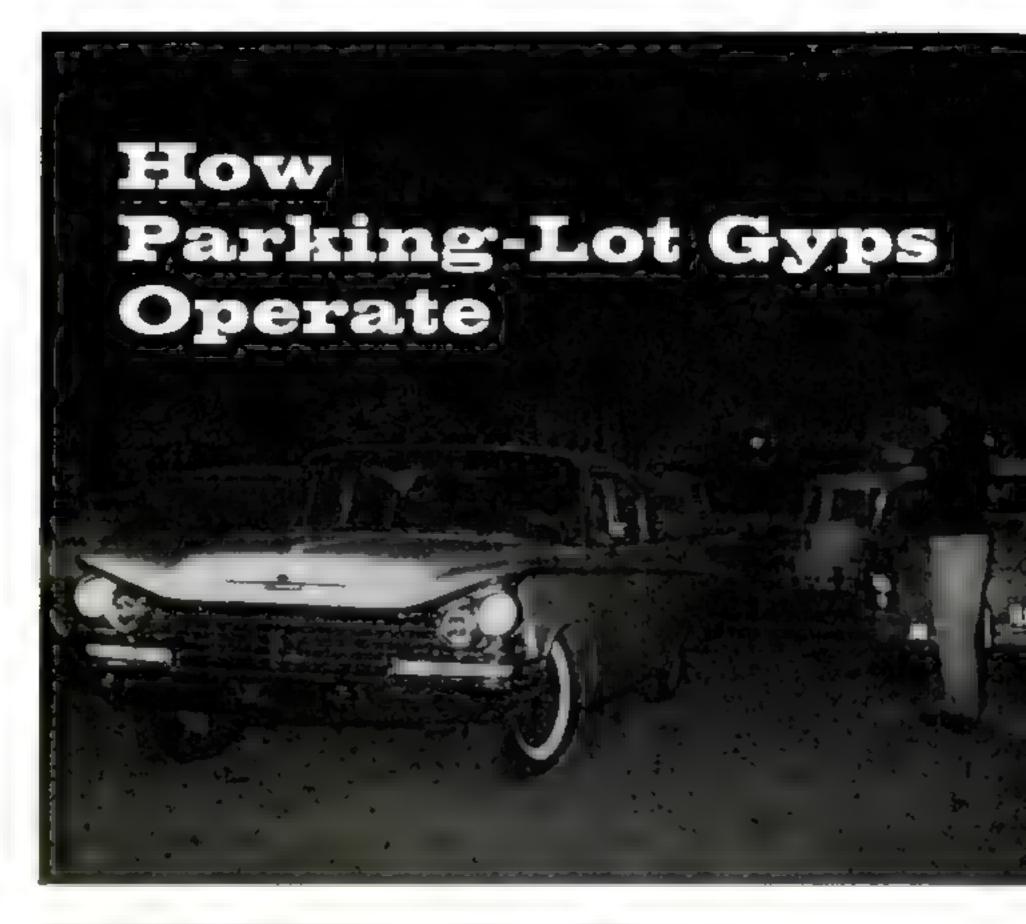
Phone plays back messages

Here's a Hungarian telephone that not only records messages but plays them back if the subscriber calls from another phone—but only when he gives a code signal. The secret triggering is done with a slot in the prerecorded tape that instructs a caller to leave his message. When the subscriber utters a sound at the right point in this statement, the playback mechanism is actuated. The tape won't respond to a constant sound. It clams up completely if a would-be eavesdropper calls and makes two wrong guesses, even if his timing is correct on a third try.



Turns ore to iron

Dispensing with a blast furnace, this huge 122-foot pressure cooker will extract iron directly from the ore. Upended, it will use hydrogen gas at high pressure and temperature to reduce the iron-oxide ore to metal—the way carbon monoxide, from burning coke, does in a blast furnace. Riding across country on a string of railroad flatcars, the 238-ton vessel is shown on its way to Bethlehem Steel's Los Angeles plant, to apply the new process.



# Not all parking-lot guys are crooks—and they're not all honest, either. Here's how to foil the sticky-fingered ones

By M. Robert Beasley I AVE you ever driven from a parking lot or parking garage frowning over the bill? It was impossible—you couldn't have been parked that long?

Yet the length of time that you parked was there on your ticket in plain black-and-white. At least, it seemed to be.

There's a good chance that you were right. You hadn't parked that long. You were gypped. You were the victim of a practice known as ticket-switching. It is only one phase of the parking-lot and garage racket.

Getting exceptionally low gas mileage on your car? Some

of your fuel may have been siphoned off for resale.

Getting poor tire mileage? Those shoes on your car may not be yours at all.

Battery wear out too fast? It may be a substitute.

How do the dishonest parking lots—or, as is more often the case, the dishonest attendant working for an honest owner—get away with it? That's easy . . .

# Take the ticket-switch, for example

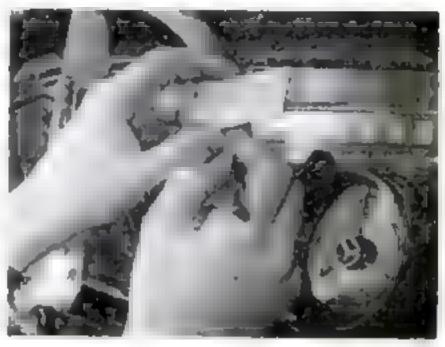
Let's say that you drive into a parking lot at two p.m. The rates are 35 cents for each half-hour or fraction thereof. Thirty minutes later you come back for your car. Your bill: 70 cents. That's funny—you've been parked only a half-hour, or thought you have. You're annoyed, but you pay

You've been bilked. Thirty-five cents went into the attendant's own pocket. Instead of giving you a fresh ticket stamped at two p.m., he gave you a ticket that he had issued to another motorist who drove in at 1:30 and drove out at 1:55. You failed to notice the time stamp. The attendant is in the clear on the lot owner's time clock—besides his personal profit, he has 35 cents to turn in for the half-hour's parking registered on the clock.

Why do you pay? Because you won't make a scene for 35 cents, and the attendant knows it.

You can protect yourself from this particular deceit by marking your own time

on the back of the stub—and your mileage. Let the attendant see you do it—in fact, ask him for the time. He will omit your car from the ones marked for a fast shuffle.



One way to protect yourself: Mark mileage and time on your parking ticket.

## Then there's the gas-gauge racket

It's even easier than the ticket switch. All the attendant has to do is park your car where the back end is hidden, start a siphon into a five-gallon can, and walk off. He's sharp.

He knows how long it will take to fill the can. He has checked your gauge. He knows he can drain off five gallons without your becoming suspicious.

This dodge is particularly lucrative where parking lots or garages offer gas and oil services. The man who tells the attendant, "Fill 'er up while I'm gone," gets gas from your tank. The proceeds are clear profit for the attendant.

Sometimes the thieves—because thieves they are—take only a couple of gallons from each of several cars, but they do it with deadly regularity, day after day.

"Don't buy a Buzzard V-8

like mine," victims tell their friends. "It's a gas hog"
You can foil such thieves. Install a lock cap on your tank—and keep the key in your pocket. A good check on tank-tampering is to put a grease-pencil mark on the glass covering your gauge when you park. The pencil mark is removed easily afterward with a piece of tissue.



The thieves may take only a couple of gallons from each car, but they do it with deadly regularity, day after day.

## Accessory-stealing really pays off

Usually the switching of tires, batteries, and even radios and heaters is confined to "transient" cars, particularly those with out-of-state plates. The attendant with sticky fingers

parks his own car on the lot where he works. His trunk is loaded with worn-out replacements for what he wants to steal.

A standard practice at many lots is to ask how long you intend to be, "so we'll know whether to keep your car handy," This can be a perfectly legitimate question—the lot wants to keep the shortstay cars in front. But it can also open the door to larceny. It takes a little time to strip a car.

Switching a battery is almost foolproof. The worn one put in the place of yours has enough charge to give you several days of driving. There are countless cases where entire sets of new tires

have been replaced with worn ones having re-cut treads. You don't know you've been robbed until the casings, weakened by the cutting, begin giving you trouble.

The tire-and-battery racket flourishes because not one motorist in a hundred can identify his battery or tires. Could you?

Often, spare tires are just stolen outright. Attendants are reasonably sure the customer won't check the trunk before driving away. Once he's gone, pinpointing the time and place of such a theft is almost impossible.



Not one motorist in a hundred can identify his own battery or tires. Could you?

## The crooks love it when you leave your keys

You yourself make your car easier to "work" if you leave your key in the ignition. You compound your carelessness if you keep all your keys in the same case with your ignition key.

Thief-attendants like to move a car to an isolated corner of the lot or garage. They have an approach to you if you're the type who likes to lock up his car-the lot rules per-

mitting.

As one veteran thief, who has made a plush living from parking lots for 20 years, explains it: "If I spot a car that I want to work on, I don't give the sucker a chance to think of locking up. As he pulls in, I yank open the door, help



If you must leave the ignition key, DON'T leave others with it.

[Continued on page 224]

## 7 Quick Tips on Parking

You can give yourself reasonable protection while parking if you remember and practice a few simple precautions. Make a check list of the following suggestions and paste them on the visor

 When parking, don't tell attendants how long you will be gone, unless it is a very

short time.

Mark the back of your ticket with arrival time and your mileage.

- Have a gas cap with lock, and keep the key in your pocket.
- 4. Wherever possible, park the car yourself and lock it, retaining possession of the key.

Where the key must be left in the car. leave the ignition key only.

Always lock the glove compartment. Don't leave valuables in the car where they can be seen.

7. Have your car serviced only where you know the management and employees.

# New Ideas from the Inventors



Fins Help Brake Car. Wheel brakes alone, according to this recent GM patent, won't be adequate for near-future cars cruising at 100 m.p.h. or more. But

by disrupting an auto's streamlines—and thus increasing air drag—these spreadable fins would slow a car to where its wheel brakes could take over.

Ring Keeps Level on Hand. You wouldn't have to grope for your spirit level if it were built into a square-bottomed finger ring like this. The wearable bubble would not only be handy for frequent checks, but could also be held by the same hand that grips or guides the work.

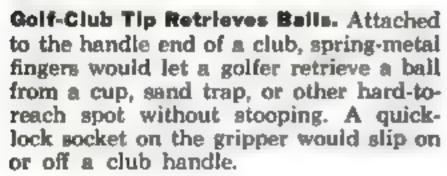
Vacuum Lifts Hair for Trim. With this suction nozzle attached to his clipper, a barber could shape hair for a brush trim regardless of its natural fall. Guided by an adjustable frame strapped to the head, the clipper would cut the lifted hair on a straight-across line.





More Inventors' Ideas







Magnets Speed Cowboy's Draw. A young gun toter could start throwing lead faster if he wore his weapon on this steel holster. Two magnets in the gun would grip the plate but allow a quick, no-fumble draw. A stop on the plate would keep the gun from sliding down.

No-Tip Seat Slides for Entry. Hinged front seats of two-door cars can be dangerous when sudden—or crash—stops throw rear-seat riders forward. This

safety seat would slide inward for convenient rear-seat access. Frame members would telescope; a small motor might be used to compress foam-rubber padding.

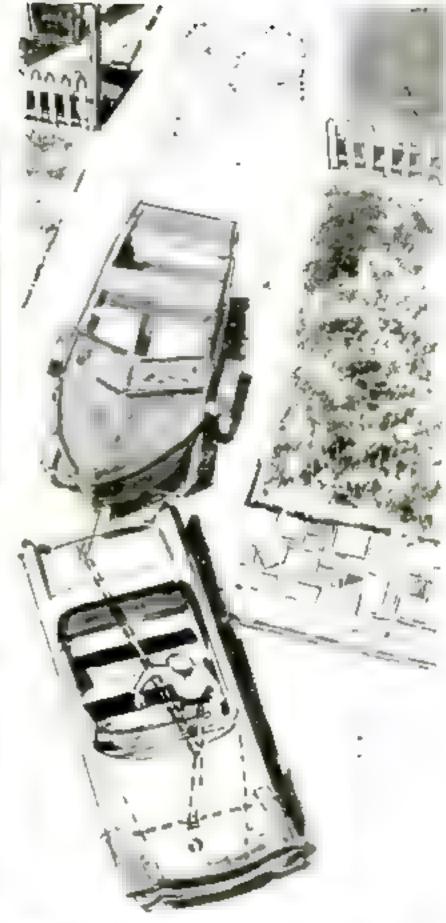




Wired Belt Demands to Be Used. A car with this seat belt couldn't start if a driver or passenger neglected to strap himself in. Wires in series with the ignition switch would be laced through each belt. To close circuit, each buckle prong would have to touch a recessed eyelet.

Two-Blade Knife Shapes Plaster. The combination of a fixed and slidable blade on this plastering tool would let you manipulate the filler and shape it to the work. You could use either the straightedged blade, or advance the slightly concave one, to form flat or rounded joints, fill gaps between wallboard edges, or feather the margins of a fill.





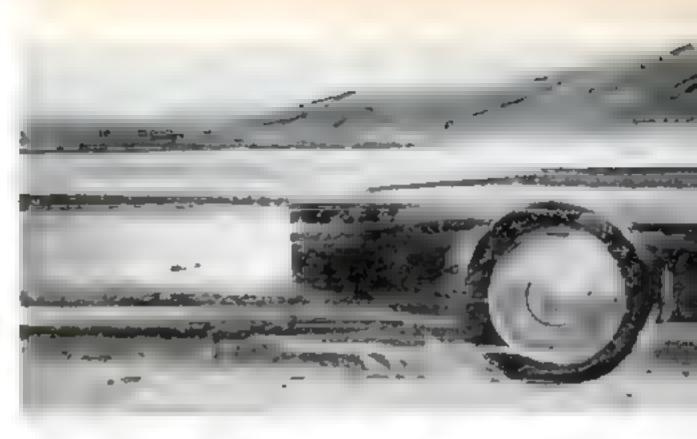
Hitch Backs and Steers Trailer. Maneuvering a small trailer around corners or in reverse might be simplified by this steerable hitch. With its forward arm clamped to the tie rod, turning the car wheels would angle the pivoted follower arm and steer the trailer. Bent under-car parts would clear transmission dips.

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**DOCTOR-DRIVER** Nathan Ostich holds model of ear. It is jetpropelled—no gears to wheels.



# Jet Car Aims at 500-

This bomber engine on wheels may clobber the 394-m.p.h. land-speed mark set in 1947

A speed demon on the side, Dr. Nathan Ostich, will climb into his revolutionary 6,000-pound Flying Caduceus this summer and blast off across the glaring salt flats of Bonneville, Utah. Blast off is right, This car is jet-propelled.

In his sleek, streamlined monster, twothirds of which is engine, the racing medico hopes to shatter the late John Cobb's record of 394.2 miles per hour, and set a new land mark of at least 500 m.p.h.—or maybe even 600.

"Piston engines," he says, "have about

reached their peak,"

The first man to race on Bonneville's salt track, Teddy Tetzloff, hit the dazzling mark (for 1914) of 147 m.p.h. Twenty-one years later, Sir Malcolm Campbell clocked 301.13. The British were on their way. In 1937, Capt. George Eyston made 311.42, raised it to 357.5 the following year. And in 1947 John Cobb set the record that still endures—394.2 (403 m.p.h. on one run).

fast company. Dr. Ostich, a craggy-faced 50-year-old bachelor, is an old hand at Bonneville, holding several class records (his best: 189 98 m.p.h. with a Chrysler-engined Henry J). This year he'll have dangerous company. Hot-rod artist Mickey Thompson will be there with his revamped four-Pontiac-engined

job. And Britain's Donald Campbell, the water-speed champion, will bring over a Bluebird powered by a gas turbine of the type used in Britannia turboprop airliners.

But nothing like the Flying Caduceus has been seen in Bonneville's 46 blazing years. It is a long, aluminum-skunned assembly of seamless tubing with a wheelbase of 12½ feet. The engine, a GE turbojet J-47 (from a B-36 bomber), weight 2.350 pounds and develops 5.200 pounds of thrust, and nearly 7,000 hp. at 500 m.p.h.

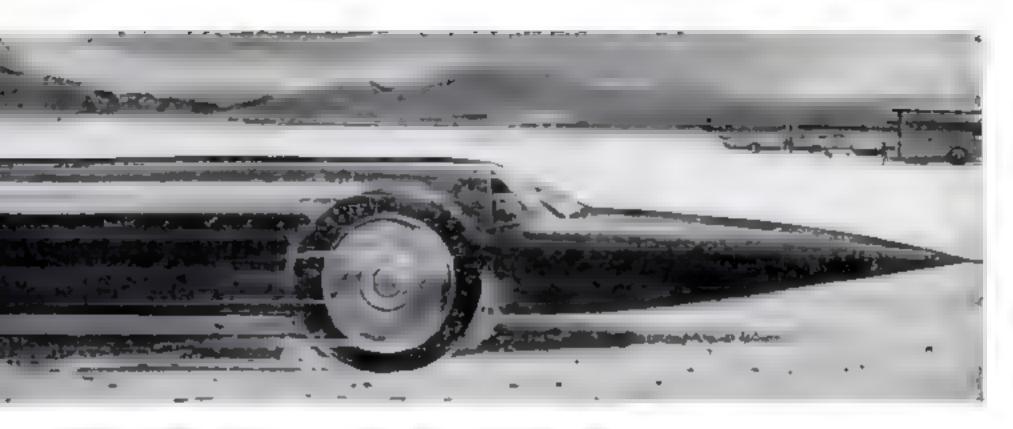
It gulps 15 gallons of JP-4 fuel a minute, but fuel storage is no problem because a single run will require only seconds. The 40-gallon tank is big enough. The car should reach 500 m.p.h. in  $42\frac{1}{2}$ 

seconds.

The driver sits just ahead of the engine, with thick bulletproof glass shielding his face against the vicious air blast. The instrument panel holds gauges showing engine temperature, air speed, fuel consumption. Two-way radio will report unforeseen trouble, such as a tail fire.

Braking from 500 m.p.h. To stop at the end of his run, Dr. Ostich will kill power and coast until the car is loafing at 300. Then he will eject a ribbon-type drag chute to slow to 176. After that he can ease on the four-wheel disk brakes.

The 500-mile-an-hour car is the result of two years of development and research involving a whole battery of engineers. Ray Brock, technical editor of *Hot Rod Magazine* designed it, but backing him

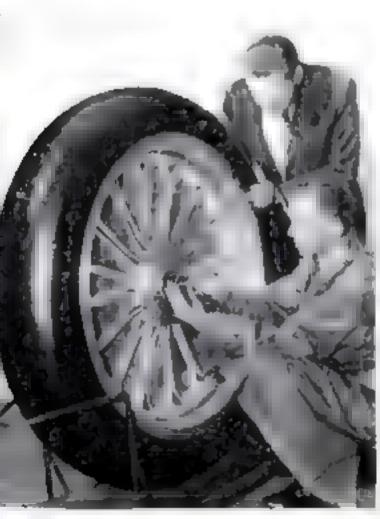


# M.P.H. Record

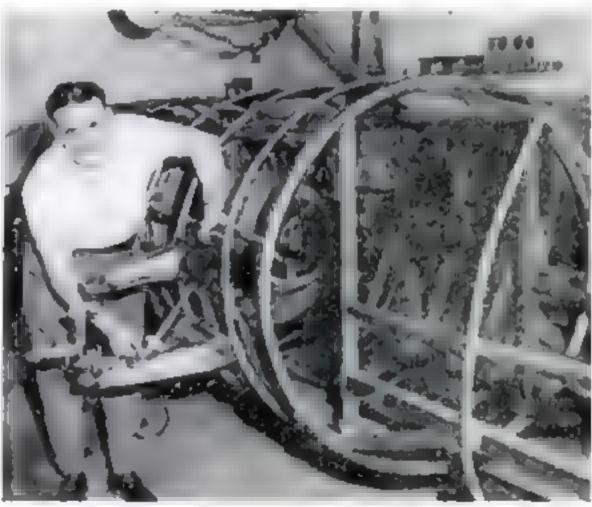
up were veteran racer Ak Miller; air-duct engineer A. C. Sterling; scientists at California Polytechnic College (who ran wind-tunnel tests and electronic-computer calculations); and a group of men, headed by Bill Rowan, from Firestone Missile Division. Firestone Tire designed and manufactured the wheels and tires—critical components for such speeds.

Two scale models of the car were built for wind-tunnel testing, which dictates design of the body so that the car will not take off into the air like an airplane. Most cars of the past had stabilizers such as big tail fins, but tests proved a fin unnecessary for the Flying Caduceus.

The final model is simply a long, slim cylinder with a needle-pointed nose cone. The wheels are exposed, although most previous contenders faired their wheels into the body. Housing the wheels reduces wind resistance, but it also demands greater body width, increasing airplane-like lift. The vastly greater borsepower from the jet engine will overcome wind resistance.—Robert M. Hyatt.



safe for 600 M.P.H., treadless nylon-cord tires, 48 inches in diameter, fit aluminum wheels.



HUSKY SUSPENSION hangs unstreamlined wheels outside body, which is just a tubing-reinforced can surrounding the big jet engine. Parachute will slow car before disk brakes are applied.



# These are typical "unmarks"

MAKE OR MODEL can't tip off a police car in Delaware. Here Plymouth, Chevy, Ford, and Rambler American are among the ones off duty at a state-police barracks.

# Unmarked Police Cars: Good or Bad?

### By Edward D. Fales Jr.

You'LL be seeing lots of unmarked police cars on the road this summer. More accurately, if you're a fairly law-abiding driver, you'll not be seeing them.

More than 30 states are now using plain-clothes police cars. Two years ago, Wisconsin began with 10. It now has 25. Indiana has 60. Connecticut changed half its entire fleet to unmarks. And Delaware has stripped off all distinctive buggy-whip antennas, red beacons, and police insignia—and has gone 100 percent to unmarks.

"It's psychological warfare," says Delaware's state police superintendent, Col. John P. Ferguson.

"We want you to think," another officer told me, "that any car behind you may contain a policeman."

Is this good? Is it a real step forward in enforcement technique, or is it simple entrapment? Is it safe? How do patrolmen like it? What does a driver think when an unmark pulls him over?

To get some answers, we rode for three days and two nights with Delaware troopers. We hadn't been out two minutes before we had our first "case." We were riding in a blue-green Chevy Biscayne. It had no special tags, signs, or lights. Our aerial looked like anybody's, except that it didn't telescope. Our driver, in full uniform, was Trooper First Class Francis Melvin.

We headed south on U.S. 13, a divided highway. Suddenly a Pontiac in a hurry charged out of a driveway and cut in ahead. Melvin braked down hard,

"This never happens to us in a marked car," he said, "People are so polite then.

### Clocking a speeder is easy in a



TROOPER IN CHEVY completes "clock" on man in Rambler (picture 1). In pictures 2 and 3 he overhauls speeder and, using siren, pulls him

#### Here's one big difference between marked and unmarked cruisers

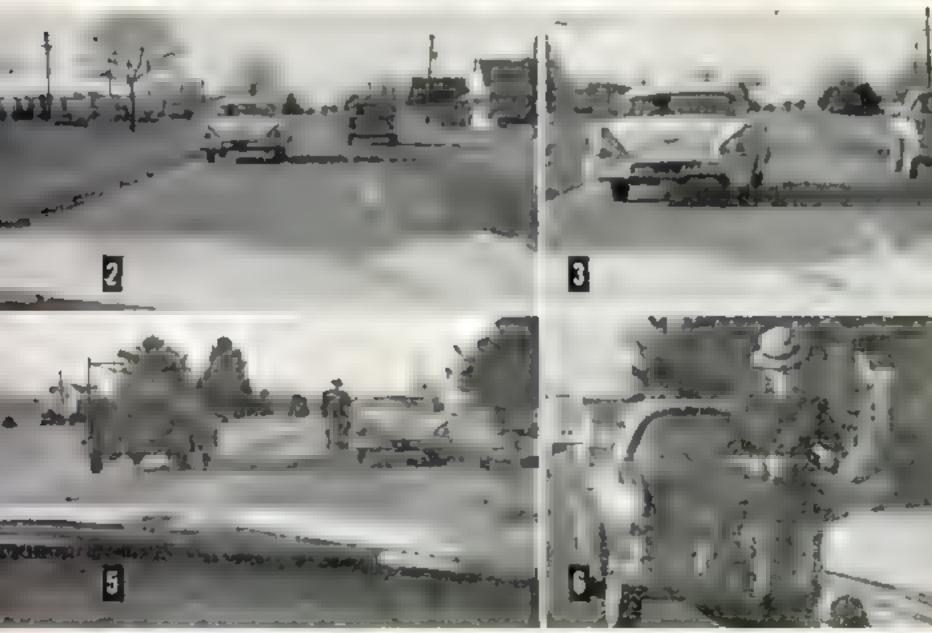


ALMOST EVERYONE passes an unmarked cor under the same circumstances. But alert drivers,

noting the uniform, move on decorously.

NOSODY PASSES a plainly marked pohee car crusing within three or four in p.h. of the speed limit. Instead, everybody stays demurely back.

plain car, but stopping him may require a warble from the siren



over Pictures I through 5 were taken through windshield of a second plain car following the first. 'Catching' is tricky from an unmark be-

cause it may startle a driver or make nervous women suspect a stick p or p kup Police make sure their uniforms are charles visible.

## Some drivers are serenely unaware as they sail by two troopers



FOUR DRIVERS, hitting it up a little above the legal limit, barge past uniformed troopers in



this sequence. Driver A is the only one alert enough to pull over to the right lane and case

But in a plain car we get the works like anybody else."

He didn't stop the Pontiac—just eased ahead, letting the driver get a good look. The driver saw the uniform, gulped, and slowed down.

Moment of meckness. We stopped for a light, and a station wagon raced recklessly across U.S. 13. Then the driver spotted Melvin's uniform. The station wagon humped forward in sudden deceleration, and proceeded so meekly that we all laughed.

"He'd have spotted a marked car at once," Melvin observed, "But as soon as we were out of the way he would have been up to his old tricks.

"This is one strong point about a car like ours—it has what you might call a 'halo of influence' that reaches clear to the next state. Knowing that plain cars are around, that fellow won't rush any more lights in Delaware." We began to see the psychology: It was almost as if we had thrown a mental lasso around a reckless driver.

Wising up a wise guy. Later a pickup truck, trying to "push" us faster, blasted our mirror with his high beams and stayed there. Then he swerved ahead, cut in front of us, and abruptly turned right into a driveway. His action said clearly: "I guess that'll show you!" He practically swallowed his gum when our Chevy stopped and a man in uniform strode up. Melvin wrote a warning.

"He'll think twice before he annoys any motorists again," the trooper said as we drove off. For the guy in the pickup it was an upsetting experience. It would affect his future driving habits.

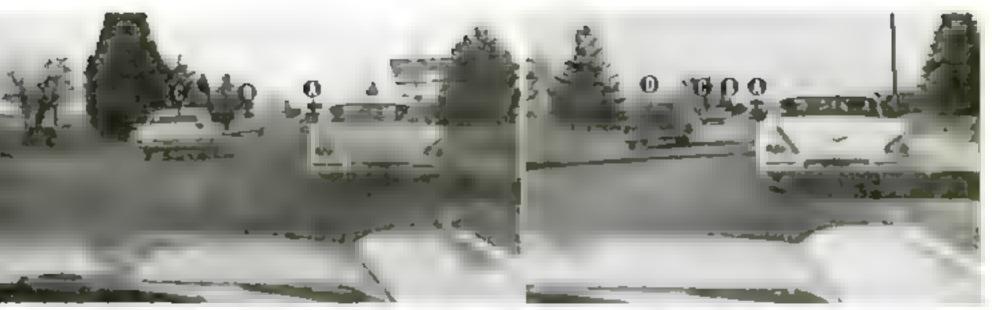
On later patrols, we saw many things police rarely see from marked cruisers: a woman with a carload of kids sneaking through a stop sign; two cars running a red light; a speeding driver who slowed down when he spotted radar—and then speeded up when he thought he was unobserved.

Some motorists, we'd heard, complained that unmarked cars were "sneaky." In fairness we must say that we saw no sneaky activities by any of these Delaware troopers. The only sneaky things we saw were being done by ordinary motorists, Nor did these well-trained young officers seem to feel they had a grievance. At no time did we

# Even the "old foxes" can be caught this way

wise in the ways of cops, interstate truck drivers are tough to clock from a marked police car. But the driver of this semi, tooling along way above the limit, ignored the seemingly harmless sedan that dogged him. When sirened over to the shoulder, he explained imaginatively: "There must have been more tail wind must I thought."





off. But B, C, and D keep going briskly, not quite fast enough to warrant being stopped.

Troopers watch out for recklessness or incompetence quite as much as for speeding.

tail anyone just waiting for him to do something wrong.

One night a car whirled out of a street ahead, backfired, and dug out fast. Noisy mufflers have become a plague in Delaware, so Trooper Melvin spun around in pursuit. Our siren growled, Melvin switched on our inner light—so his uniform would be seen. The car stopped,

Melvin read the lad's license, "Now, George," he said, "push your brake while I check your lights." Stop lights not working. Melvin noted a jagged window pane—deadly and illegal, "Now pull your hand brake," he said. Incredibly, it came right out in the driver's hand.

"Now," said Melvin, "let's hear your muffler."

George gunned his motor tactfully. The exhaust burbled. "Now I'll try it," Melvin said. He floored the gas, then let go: "Blaa-a-pop-BANG!"

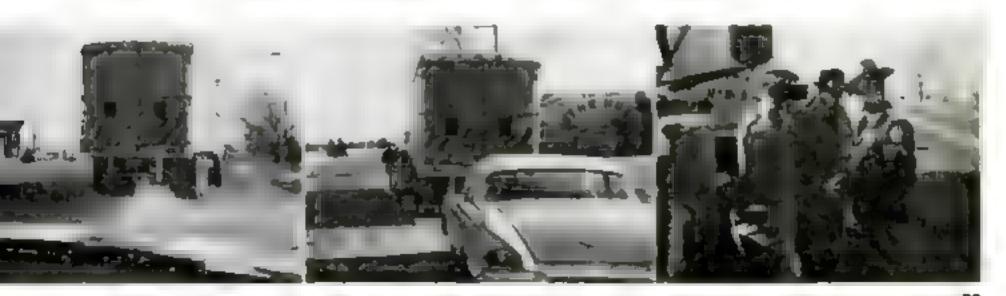
Melvin might have thrown the book at this lad. Instead, he wrote a warning "George, I'll give you five days to fix things and get a real muffler. And I don't mean steel wool stuffed up this one."

Drivers often got warnings instead of tickets. This wasn't all charity. "We'd be in court all day long," a trooper noted, "if we arrested drivers for all the things you see from these cars."

The driver's angle. To see how the public felt about unmarked cars, we began interviewing drivers who were stopped. One in five objected. A truck driver said, "Unfair." A garageman said, "For me, I don't like them. For the other guy, it's all right." A Maryland salesman said, "If I need a cop how do I know when I've found one?" (It seemed a good question.) A Pennsylvania city official, caught speeding, said: "Honestly, I think it's a good idea. I'm going to put this in effect back home."

Surprisingly, not one Delaware driver objected. One Massachusetta man in a Cadillac did—but he is one fellow we did not talk to. He spotted us, got behind us, and kept flashing his headlights to warn other cars. That's what he thinks of unmarks.

He was taking a chance. Any trooper knows that if you want to arrest a driver for something, just follow him long enough and he'll make a mistake. Our trooper could have caught this amateur Paul Revere for something. Instead, he



#### Crosley That Caught the Caddy



In Delaware last spring, a Cadillac traveling at high speed carelessly crowded a tiny Crosley station wagen toward the ditch. When the Cadillac driver noticed the little car coming in pursuit, he pulled away at 90 m.p.h.

At a traffic light down the highway. where the Cadillac was temporarily halted, bystanders were amused when the little station wagon puffed up. It disgorged a trooper in uniform who promptly arrested the speeder

"His mouth fell open so wide you could have stuffed a watermelon in it." says Trooper Walt Saxton, "It's my own Crosley—not a regular unmark. I was on my way to work. I floored her and got her up to 70. But the crankshaft fell apart a few days later."

laughed, turned around, and cruised the other way.

Delaware, we found, uses her unmarked cars for patrol work of any sort. Some states use unmarks only against "hazardous violations"—drinking while driving. running red lights, racing, speeding, and trucks tailgating each other. We were to see how useful plain cars are against speeders.

Stopping the wily ones. "It is almost impossible to catch speeding trucks with marked cars," a trooper told us. "Those

old pros can smell a police car a mile away."

We were waiting in two plain blue cars when a big Florida truck went by. This bird was hitting above 60, weaving through traffic. He saw us clearly.

"If we had whip aerials," one trooper remarked, "he'd be down to 45 already,"

Out we went. We know he saw us coming up fast—because he said so later. "But I didn't guess you were the cops," he said. "It's getting so you can't spot a police car any more. Do you think it's fair?"

We couldn't answer, because we were beginning to realize that it is a doublebarreled question. The other half of it is: "fair to whom?"

"Wrong-siders." Late one night we heard an urgent message on the radio: "Stop car driving south at high speed in northbound lane." Some drunk had gotten on the wrong side of the divided highway. The scene was 60 miles away, and we waited helplessly for reports of the head-on crash, perhaps with some unsuspecting, law-abiding family. Would it be unfair to that drunk to have stopped him with an unmarked car? What about fairness to the family?

This crash never came off; they caught him first. But night after night those "wrong-side" drivers charge down many U. S. roads. We saw one miserable pile of junk—all that remained of a recent "head-on."

"Against guys like that we need every weapon we can get," a trooper told me. "This is no game of tennis. Besides, if they see us coming in a marked car, the chase gets faster and lasts longer."

We were southbound on U.S. 13 when Melvin said quietly:

"Speeder coming north."

It was a drizzly evening, near supper-[Continued on page 195]

#### Officials Differ on Unmarked Cars.

Police departments, state officials, and automobile associations have mixed feelings

about the wisdom of plain cars:

1. The more than 30 states now using them naturally approve in greater or less degree. Argues one state-police official: "Unmarks are essential for good enforcement, because they are the only way that some offenders can be caught."

2. The American Automobile Association

opposes the use of more than a few unmarks for special investigations. It believes that marked cars do more to discourage violations because of their ready visibility.

3. The National Safety Council and the International Association of Chiefs of Police favor unmarks "when the job can't be done

by marked cars."

 Legislatures in Georgia and North Carolina recently voted a ban on unmarks. Minnesota forbade the purchase of additional ones. Wisconsın recently said "ves."



### Car charges front and rear

Power from 18 two-volt batteries under the hood and 18 more under the rear deck operate this electric car. It has a top speed of 35 m.p.h. Its range is 40 miles if run constantly or 50 to 60 miles with frequent stops. It can be recharged overnight from a 110- or 220-volt outlet.

The Henney Kilowatt is built into a Renault Dauphine body with the rear seat removed to make room for a controller, which is regulated by a foot accelerator. This varies voltage going to a traction motor connected to reduction gears and rear axle. A switch on the dash puts it in forward or reverse.

The car won't be sold to the public. It's designed for short-haul utility maintenance and meter-reading use. The maker is Henney Motor Co. of Canastota, N.Y.



Recharging on house current.



#### For rocket archery

The bales of straw at left above take the impact of a test-fired British Seacat missile. The archery-target technique, developed by Short and Harland, Belfast, Ireland, eliminates need for an extensive firing range. The angle-iron frame at right serves in place of a naval vessel's more elaborate launcher.



Fiber nest for laying hens

A fiber cushion instead of litter is being used in hen houses at Pennsylvania State University's agricultural experiment station. New-laid eggs roll out of a hole in the back into a mechanical collecting tray before they can be soiled. The cushions are brushed clean periodically or washed by a hose and water.

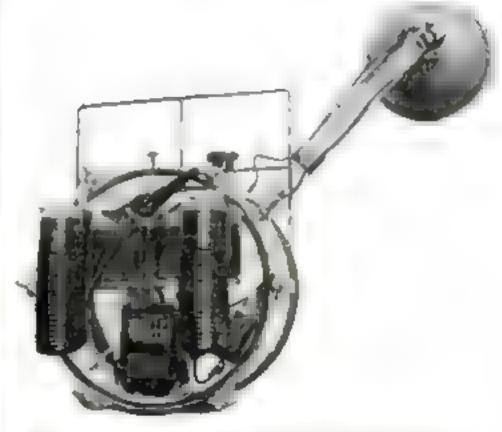
# What's New for Skin Diving



Diving mask for deep-water and lung divers has two metal prongs protruding from the front. When squeezed together they pinch the nose inside the mask and relieve pressure on the ears. It's said to speed up descents. \$6.95. W. J. Voit Rubber, 45 W. 18 St., NYC.



Free skin-diving lessons come with the purchase of equipment at the Blue Fin Aqua Shop in Inglewood, Calif. The indoor pool is part of the store. It's a trend developing among West Coast shops that specialize in diving.



Light meter and camera are sealed inside this plastic housing. The BC flashgun is mounted outside for better lighting angle. Custom built for Leica. \$150. Dive-Rite, Box 3445, Long Beach, Calif.



Night-diving lamp, strapped to the head, has a sealed-beam bulb and a dry-cell battery that clips on the belt. Exposed parts are dipped in plastic. On diver's wrist is an Admiral compass-depth gauge, Lamp, \$9.95; gauge, \$15.95. Ski N'Dive, Bellflower, Calif.

\$2 POPULAR SCIENCE JULY 1960



Caution—diver below. Diver's flag, with a diagonal white stripe on orange-red background, has a plastic batten in the top edge to keep it flying. Staff is hollow plastic, weighted at the bottom. \$8.95. U. S. Divers Co., 3323 West Delhi Rd., Santa Ana, Calif.

Olving for gold, a new West Coast hobby, is done with a portable venturi-type dredge. It sucks up sediment, traps any gold dust or nuggets, and spews everything else out the other end. Prices start at \$215. Portable Drill & Dredge Co., Pomona, Calif.

Two-man Italian sub has 18-foot fiber-glass body weighing 500 pounds. It runs four hours on batteries, does four m.p.h. sub-merged, six m.p.h. on surface. Breathing equipment is built in. Deluxe version, \$2,500. Healthways, 3669 7th Ave., Los Angeles.

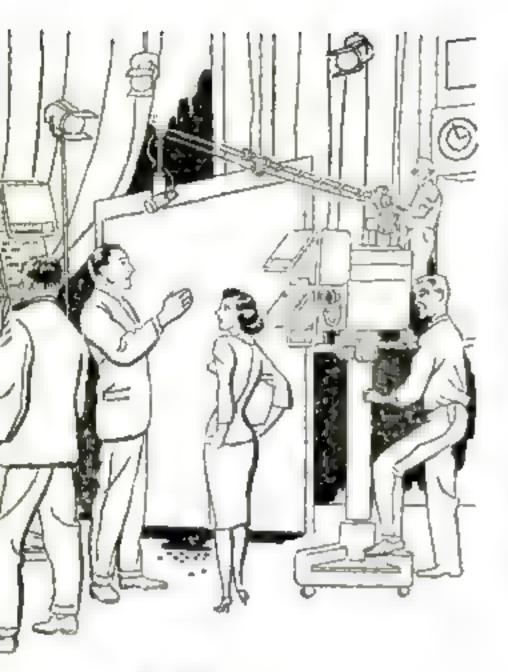


Underwater housing of aluminum has ingenious adjustable controls that can be connected to over 80 percent of the 35-mm, cameras now on the market, its makers say. The Mar-Vel sells for \$95.00. M & E Marine Supply, Camden, N. J.





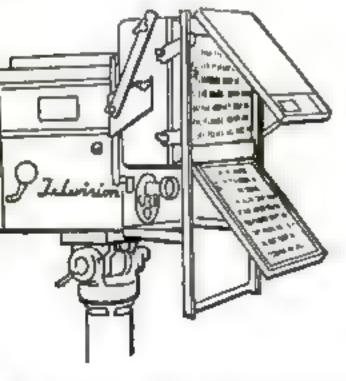
# How a Teleprompter Works



ATCHING a famous actress fumble her lines gave Fred Barton the idea for the teleprompter. His original device, built in 1950 while he was a member of the "Mr. Roberts" cast, was a roll of waxed butcher's paper mounted in a box and cranked by hand.

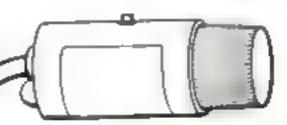
Today the TelePrompTer Corp. rents an electronic version to TV stations, film studios, and business and political organizations. The company's big break came in 1952, when former President Herbert Hoover used a teleprompter to deliver his speech to the Republican National Convention. Both parties have relied on them heavily at every convention since.

The teleprompter's heart is a pair of motor-driven drums, one above the other, that wind a roll of printed paper across a viewing area. By remote control the drive motor can be speeded up, slowed down, stopped, or reversed. Accessories adapt the unit to a TV camera, floor stand, or lectern.—Erik H. Arctander.

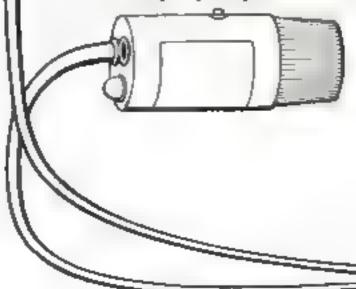


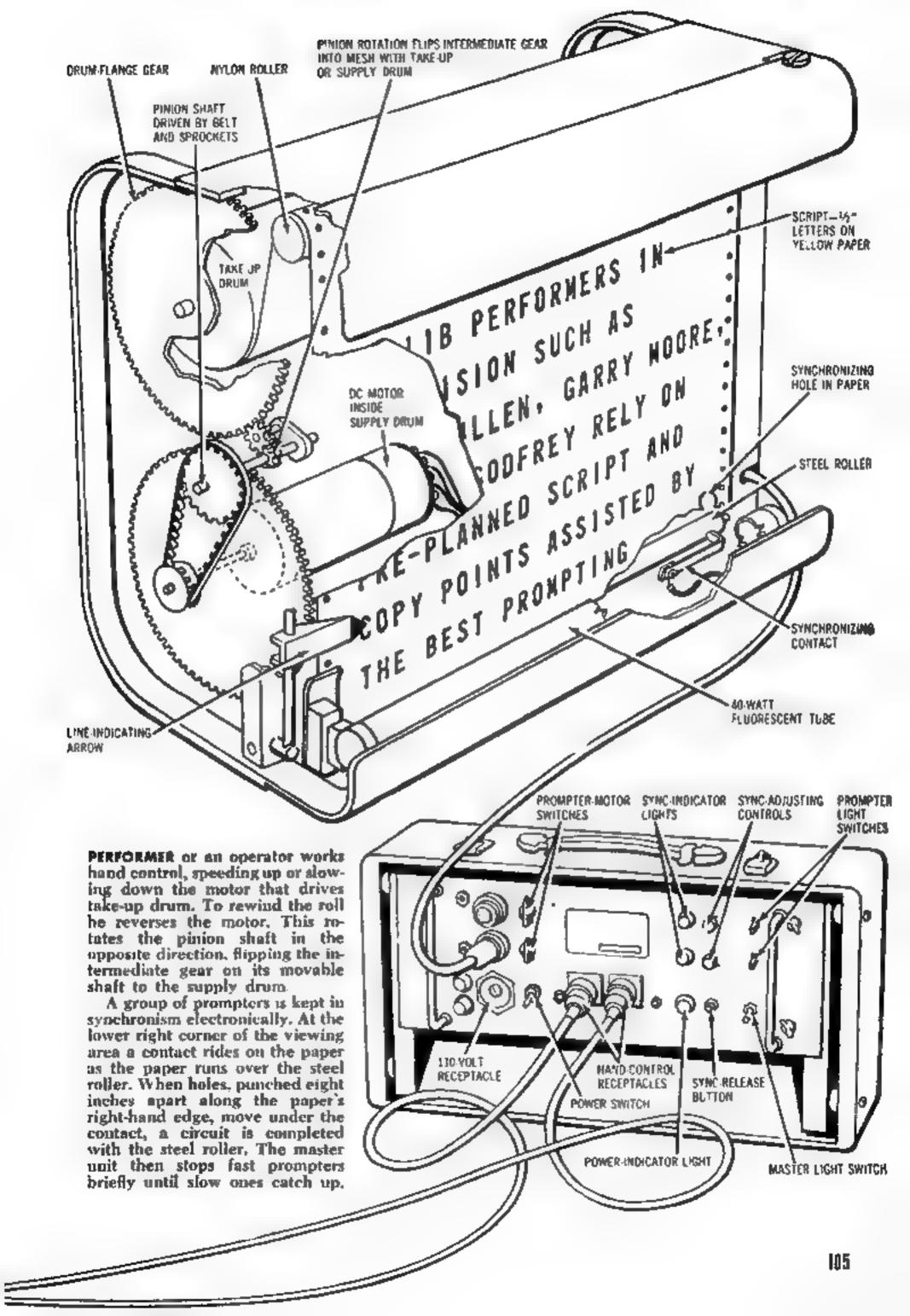
TO AVOID A SHIFTY-EYED LOOK, where a performer is supposed to be looking straight at audience, a rig like this may be used. Upper sheet of glass is a mirror, and lower sheet is one-way glass through which camera can shoot.

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SCRIPT'S SPEED is generally set by a hand control. It can also reverse direction if speaker gets behind. A second control unit is often provided that can take control away from first one. One purpose is to help confused or panicky speakers. Another is to "hand over" control to other locations if synchronized multiple prompters are in use.





## Helicopter rescues helicopter

When a Navy HSS-1 developed engine trouble on sonar patrol off the coast of Florida, the pilot managed to land it on isolated Sand Key. A big 12-ton Army H-37 then went to the rescue.

Fuel was drained from the grounded craft. Electronic and sonar equipment and both rotors were removed to lighten the load, and it was then airlifted five miles to Key West, Photos show how



Cargo sling is attached to de-rotored grounded craft . . .





These tiny mercury batteries (enlarged three times in the photo above) are only .3 inch in diameter and .125 inch high—about the size of aspirin tablets. They were developed for use in in-the-ear hearing aids, pocket radios, tape recorders, and space-satellite communication instruments. They won a national miniaturization award for the makers, Mallory Battery Co. of Cleveland and Ruben Laboratories of New Rochelle, N. Y.



#### Oversise ear that works

Simulated sound waves strike a rubber eardrum in this sculptured ear to set in motion its hearing machinery. This consists of plastic bones and clear fluid in a transparent, snail-shaped chamber where fluorescent fabric membranes resonate with the sound. Convert these movements into electrical energy, and the ear could hear. The model was built by Paul Newman, New York medical sculptor, as a teaching aid for medical schools.

### PS PICTURE NEWS





. . . rescuer takes off with rescued . . .

. . . lands it safely at naval station.



### Triple-decked fireboat

The odd-looking craft above was built for an oil-tanker firm to combat ship fires in Swansea Harbor, Wales. It is equipped with nine hoses at the corners of the two upper decks and on the pilot cabin. They deliver 3,700 gallons of water or 15,000 gallons of foam a minute. Seven of them can be aimed in the same direction. The 60-foot float is powered by two diesels and has tired wheels fore and aft to move it alongside a ship.



### Space-radiation counter

This rocket-borne missile capsule will measure radiation for NASA from 1,800 to 10,000 miles in space. Counts will be taken by radiation-sensitive strips of nuclear emulsion in its nose disk. The recovery system of the GE-built vehicle, consisting of parachute, radar, flashing light, and dye marker, has already been tested successfully in a 35,000-foot drop off the California coast from an Air Force F-104 Starfighter.



### By Frank Harvey

WERE buried in the pine forest off the end of the runway at Westover Air Force Base, Mass. We were there to witness a demonstration of a daring new Strategic Air Command technique—a tree-level bomb run

by a Boeing B-52.

It was 10 in the morning of an over-cast day—and I was cheating. I was peeking through the pines straight down the 11,600-foot runway, which converged in the distance like a Dali painting. At its end, the four-story tail of a B-52, looking like a drunken witch's hat, turned into takeoff position. The eight jet engines of the massive bomber made a hot and evil roar. As the plane finally lined up facing me, it looked like a real bird of doom—skeleton-white wings drooping and seeming almost to touch the earth, a big white beak. When the pilot moved

to takeoff power, a storm of brown smoke boiled up around the tiny distant birdshape.

"Here she comes!" I yelled to POPULAR SCIENCE photographer Bill Morris, farther back among the pines. "Get set to

shoot!"

I did not hear Bill's reply. The oncoming bomber was now filling the sky with its demon bellow. It was rushing directly at me on the ground, and showing no signs at all of getting into the air. I cocked my Nikon and took aim. About a minute passed. The plane had to get up now or run over us, and of course she lifted—just enough for the pilot to suck in his gear— then dropped a foot or two. I started shooting, working the camera lever like the bolt action on a rifle. I got off two shots when the monster suddenly filled the whole sky, whipping the 20-foot pines like buggy whips. The hot blast of the jets washed over me and



PE PHOTOS BY W. W. MORRIS

drove me to my knees. I lurched around and shot the departing bomber through its own brown smoke and the flailing brambles. Then it was gone—a diminishing roar behind the trees.

Now then—why this seemingly madcap prank? Were we risking a \$6,000,000 plane and the lives of six SAC men just for an exciting picture? Not a bit of it. That B-52 was one of hundreds that practice low-level penetrations, day and night, rain or shine, on seven separate low-level ranges in various parts of the United States. The reason: No subsonic bombers (which our B-52s and B-47s definitely are) can hope to penetrate deeply into enemy territory at 40,000 feet without meeting a withering attack from supersonic fighters and missiles. To

IN FRONT OFFICE OF 8-52, pilot and co-pilot make final checks for low-level bombing mission while waiting control-tower takeoff clearance.



### Superfortress gets preflight Inspection before each mission



LANDING GEAR IS CHECKED by aircraft commander. It will carry 350,000-lb. takeoff weight.



INTAKES of eight jet engines are carefully scrutmized with the aid of a flashlight.



MOVEMENT OF FLAPS is tested in walk-around checkup that leaves nothing to chance.

avoid this deadly exposure, some of our big SAC planes are training to go in on the deck where they can zip in under the radar screens, pop up just before reaching the target, drop their hideous hydrogen eggs, and run for home.

Delivering a "thermonuke." The Air Force is not saying one word about how that H-bomb is delivered after pop-up. Two training-drop altitudes are releasable: the so-called "short-look" at 5,000 feet-and the "long-look" at 15,000 feet. Either of these altitudes is well within the deadly fireball of a high-megaton thermonuke—so you can decide for yourself whether our boys are tying parachutes to the egg or holding off its fury with a delayed fuze until the B-52 can get in the clear.

The same opaque wall of security hides "on-target countermeasures" might take against heat-seeking or radarguided missiles launched by the enemy once our big bombers leave the deck. We know that radar chaff—light ribbons of aluminum foil—will form a radar curtain through which radar missiles cannot find their way. We also know that a rain shower can block a heat-seeker from its hot-tailpipe target. But obviously we cannot hope for convenient rain showers on a given day at a given point. So our scientists may have figured out a way to fake out the heat-seekers, too. If so, it's a dark secret. It's no secret, of course, that the B-52 can penetrate enemy country with great effectiveness while on the deck, under radar screens, so the H-bomb would certainly get fairly close to its target, no matter what the crew must do to protect itself at the end of the road

Preflight check. Now, instead of writing an exposition on this low-level run. I'd like to take you along on one. You'll ride in the jump seat behind Aircraft Commander Gerald McKay, USAF, as he penetrates the Hangover Range, in northern New England, Major McKay is an instructor pilot, which means he knows the B-52 from air scoop to tail guns. Let's walk around with him as he makes his preflight check. With a flashlight he peers into the dark maws of the J-57 jet engines. You notice that sizable bites have been filed ou, of some of the blades in the compressor—and remark

about it.

[Continued on page 210]

### One-wing jet mock-up

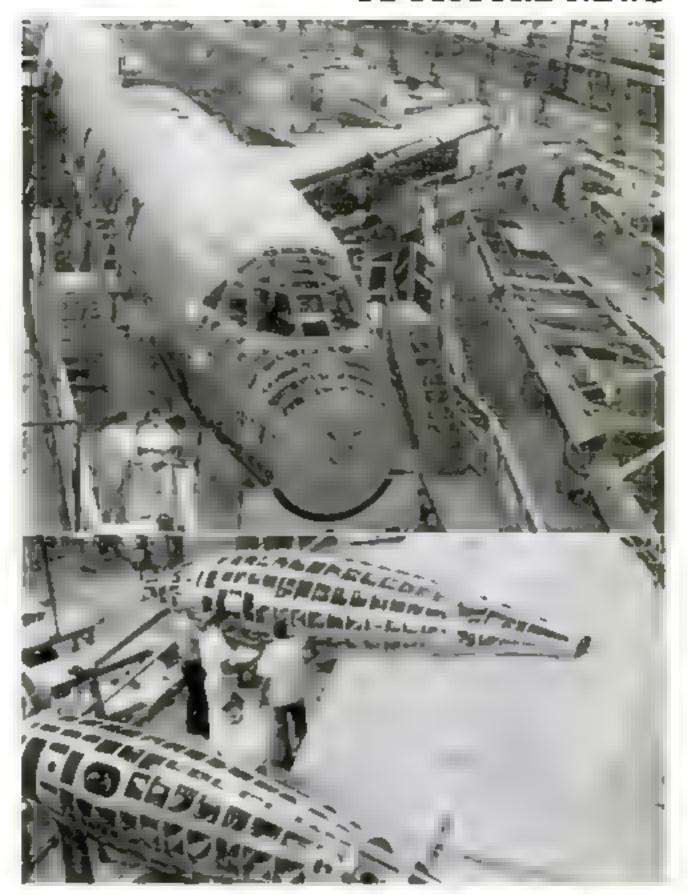
This full-size metal dummy of the up-coming Convair 600 jethner will never fly—or get its

second wing

Only partially covered with skin, it will be used to test design changes during the production life of the aircraft, and to check uniformity of wiring, flying controls, and instrumentation. Capsules on the wing trailing edge are designed to help the 600 fly 635 m.p.h.

The new Convair, a larger and faster version of the Convair 880, is expected to go into passenger service next year.

right, shown without skins, look like inverted cames. They will delay formation of supersome shock waves that cause drag. They are also fuel-carrying tanks.





### Upside-down bridge

What looks like bridge trusses being built upside down (right) are the wood forms for pouring a concrete arch. Sketch above shows how the bridge will appear when completed across the Capilano River in Vancouver, Its 347-foot span will be the longest of its kind in Canada,



### That pesky but remarkable mechanism...

The Mosquito



**DEADLY DISSECTING KIT** carried by mosquito in its beak is shown in side and cross-section views.

Nobody loves this \*\*
sleep-destroying marauder,
but you've got to admire her
as a wonderful flying machine

By Joan Steen

OSQUITOES don't bite. They're toothless. They dissect you instead, wielding a pair of saws, lancets, and syringes with fiendish skill. Squash one—in the one time in a dozen you succeed—and the blood smear is burial ground for a more delicate kit of surgical tools than man has ever made.

Dinner is served. First thing the hungry mosquito does is to stake out a claim on her victim. (The one that draws blood is the female.) She uses long feelers for this, searching for a soft, blood-rich spot. On target, with a needle-sharp beak as guide, she pricks the skin with the two saws and two lancets that are sheathed in her lower lip. As these instruments enter the blood vessel they push the lip pouch back, clearing the decks for action.

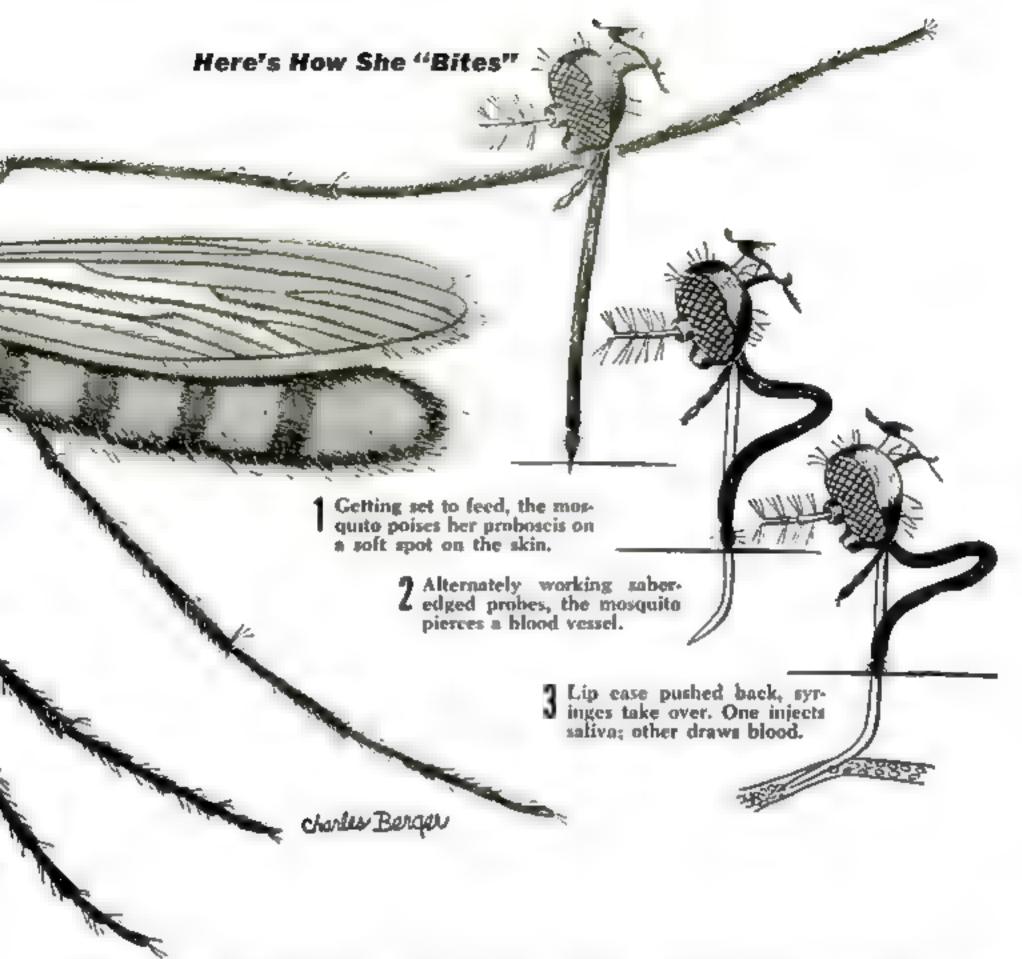
have dubbed this common species of mosquito. Females have circles of short hair on their antennae; males have spreading plumage.

"WINGED VICTORY," with

Then the syringes go to work. Syringe No. 1 injects saliva containing an anti-coagulant (to keep the blood liquid). Syringe No. 2 sucks up the blood until the mosquito's body is red and distended

Enrly-scarning system. As if slaking a thirst for blood weren't enough, mosquitoes seem to delight in warning victims with their high, whining hum. But this is not mental cruelty; the mosquito can't help it. The sound is generated by very rapid wing vibrations, generally between 160 and 190 a second, but well over 500 in some species.

These superfast wing beats are part of the mosquito's impressive flight mechanics. Most airborne insects use two pairs of wings. Mosquitoes get along with just one, But a powerful pair it is, In males



(non-blood-sucking, and inferior in all respects except flight), the wing muscles claim close to a fifth of the total body weight. They can vibrate at rates as high as 587 times a second, and send the critters darting through space at a 100-inch-per-second clip.

Mysterious thorax. The nerves and muscles that control flight are housed in the thorax, second of the three divisions of the mosquito's body. Dr. R. E. Snodgrass of the Smithsonian Institution in Washington, commenting on the simplicity and efficiency of this organ, says that it may be "the most remarkable anatomical mechanism developed anywhere in the animal kingdom." Scientists wish they knew how it worked.

The mosquito's legs, its other means

of locomotion, are exceptionally long and slender. Some species have padded feet; others have a hairy heel-like swelling at the base of their claws. Either way, they enable the insect to cope with smooth vertical surfaces. It can cling with ease to window panes or the sides of glass jars.

Pest and plague. Mosquitoes have long been considered one of man's worst afflictions. Even today, malaria—carried by the anopheles mosquito—infects two hundred million people throughout the world. Two million die of it annually.

It is now under control in the U. S. But in 1880 the town of Bound Brook, N. J., indicted a pond as a malaria source. The pond was formally brought to trial, found guilty, and its owner ordered to abate the nuisance forthwith.

### WHAT'S NEW.



### Sounds and Slides Synchronized

The programer being used above synchronizes a tape recorder and a slide projector. Pressing a button records a signal on tape that, on playback, causes the slide to change

The movie projector at right records and reproduces sound on eight-mm. film, Kodak puts the sound track on after you take the movie; then you add music, parration, or both

Slide programer, \$95; movie projector, \$345 Eastman Kodak Co., Rochester, N.Y.



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### OUTDOOR GRILL

broils and roasts at the same time on separate racks. It is equipped with a removable motor-driven spit heavy enough to hold a large roast. With stand, \$64.95. Nesco Div., Knapp-Monarch Co., St. Louis Mo.

FOUR HEADS make the hammer at right more useful than one. Tapered shanks hold them tight; a knockout pin releases them. With nail, plastic, and ball heads, \$4.95; hatchet, \$1.49 extra. Dumas Co., 1 Jackson St., Worcester, Mass.

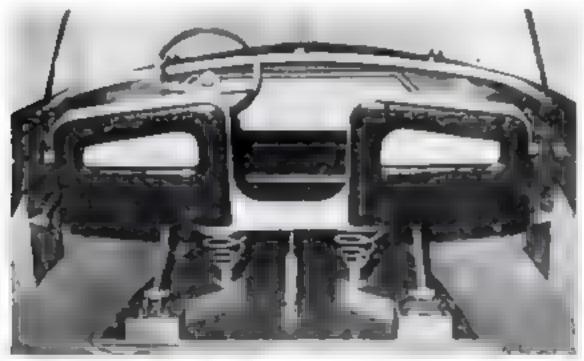




CAR-SEAT ARM REST has builtin compartments for cigarettes, tissues, glasses, and a removable coin holder for parking and tolls. A clip on the lid holds maps, and there's room for storing a camera and other items. Car-Y-All sells for \$7.95. Nu-Items Corp., 146-45 Horace Harding Blvd., Flushing, N.Y.



BELT SANDER has non-nicking back rest that keeps the rear pulley from digging into stock when you lift up the front end. It will sand flush against base-boards, stair risers, and other right-angle surfaces. Three-inch belt, \$74.50; four-inch belt, \$84.50. Millers Falls Co., Greenfield, Mass.



is standard equipment on a line of fiber-glass outboard boats called Hydrodynes by Midwestern Industries Corp., 5315 St. Joe Rd., Fort Wayne, Ind. Or the seat can be bought separately, for your present boat. A kit includes swivel, suspension, seat, and upholstery. It costs \$159. Monroe Auto Equipment Co., 1426 E. First St., Monroe, Mich.



wash and shine come from the squeeze bottle at left. You equirt Holiday on a damp sponge, rub to clean a car, and wipe with a soft cloth to polish. It's for car finishes not "too far gone." S. C. Johnson & Son, Racine, Wis.

plastic bags. They're in two parts: a loop through which you slip the neck of a bag, and a collar that slides on and is held by spurs until released by pressing. Pack of 10 for 30 cents. Polytop Corp., Hingham, Mass.



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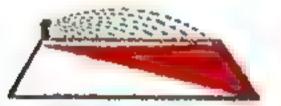
### WHAT'S NEW.



Stops set for segment of circle.



Released for full coverage.



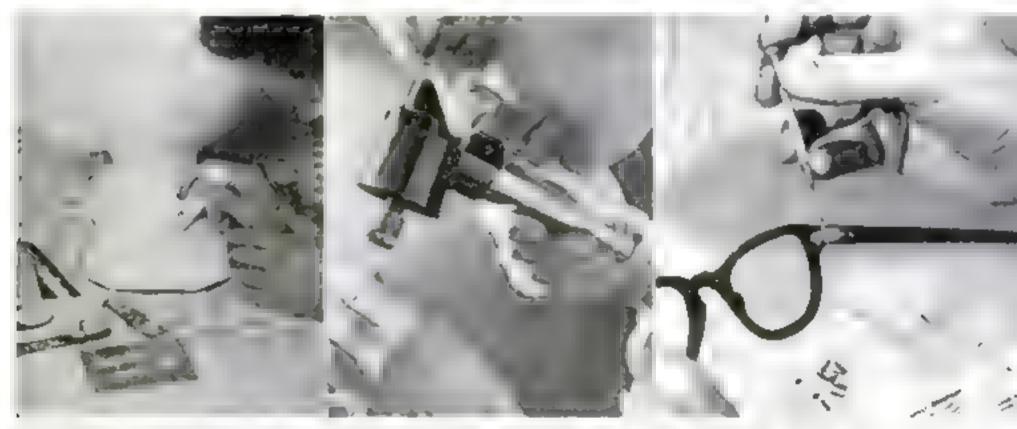
Rectangle: one side, then other,



### Stops on Sprinkler Cover Arc

This sprinkler moves back and forth between stops to water any part of a circle, even a small acute angle, and lets you make adjustments without getting wet. Remove the stops, and it revolves

in a full circle, covering up to a 42-foot radius depending on pressure. It mounts on any base. Chrome, \$6.35; brass, \$6; T-base, \$3.50 extra. Campbell's Mfg. Co., 446 N. La Cienega Blvd., Los Angeles.



white epoxy hardens to a white porcelain finish when equal lengths from two tubes are mixed. It bonds to enamel and porcelain bathroom and kitchen fixtures, metals, glass, most plastics, granite, and fabrics. 98 cents. Devcon Corp., Danvers, Mass.

PLUG VIEWER lets you examine interior of your spark plugs. A light and magnifying lens show up fouled, chipped, or cracked insulation, and enable you to check the electrode. Power is from two flashlight batteries. \$3.50. Champion Spark Plug Co., Toledo.

REPAIR KIT for eyeglasses contains an optical screwdriver and an assortment of standard screws and nuts for frames. It's useful also for working on watches and other small mechanisms, \$1. Columbia Co., 234 E. Colorado Blvd., Pasadena, Calif.



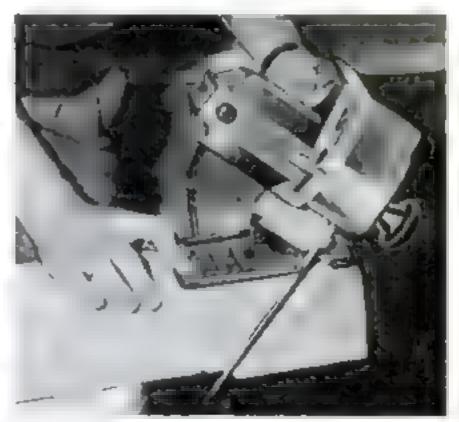
INSULATION PAD fits on the fire wall between the engine compartment and rear seat of a Volkswagen. Its heavy filling covered with red and white leatherette cuts down on both noise and heat from the engine. The pad comes with instructions for installation. Cost \$24. Earle Estes Mfg. Co., Union City, Ga.



SPRING CLAMP is equipped with toothed steel jaws that pivot to grip compound miters or other irregularly shaped work. The handles enclose a coil spring that provides 14-pound pressure. Length of jaws is 1% inches, width of opening 3½ inches. \$2.98 each. Arvids Iraids, 5930 Argus Rd., Cincinnati,



ELECTRIC CLIPPERS will cut grass under fences or next to walls, trim edges of sidewalk and flower beds, or shape shrubs and evergreens. Scissoraction blades cut a six-inch swath and are self-sharpening. A slip clutch prevents damage from obstacles caught between them. The tool alone is \$39.95; stand-up roller handle, \$5 extra. Skil Corp., 5033 Elston Ave., Chicago.



portable Jigsaw has a 4.5-amp motor, providing enough power to cut through six-inch lumber or miter the end of a four-by-four. It comes with four wood-cutting blades, one of them 7½ inches long, and two metal-cutting blades. The jigsaw has a rip guide with provision for circle cutting. It sells for \$49.95. SpeedWay Div.-Thor, 1421 Barns-dale Rd., LaGrange Park, Ill.



### Three-tiered boat trailer

For the man who has three boats and only one car, this triple-decker would be just the thing. It was designed, however, not for individual owners, but as a haulaway unit for distributors and dealers. It can be reassembled at its destination on stowed axles and wheels as three single trailers.

The triple-decker is one of eight trailers in a new Boat-Tote line manufactured by the Hardware Spring Corp. of Detroit.



### Gamma rays see inside ties

This nuclear instrument takes guess-work out of detecting hidden flaws in wooden cross ties on the New York Central. It sends low-level, nondangerous gamma rays through a tie and bounces them back to a radiation counter. Rate of reflection shows whether the tie is sound, porous, or rotted inside or underneath. Nuclear Science & Engineering Corp., Pittsburgh, built the tool.



### Captive helicopter

Flying at the end of a 78-foot swiveling boom, this helicopter gets off the ground but goes nowhere. It was invented by Leo Jacobs, Canadian engineer, for training helicopter pilots. The simulator, called a Jaycopter, can take off, hover, turn, dip, and land under control from the cockpit. Its rotor and propeller are turned by a three-hp, engine. It could make a hit at a county fair, too.



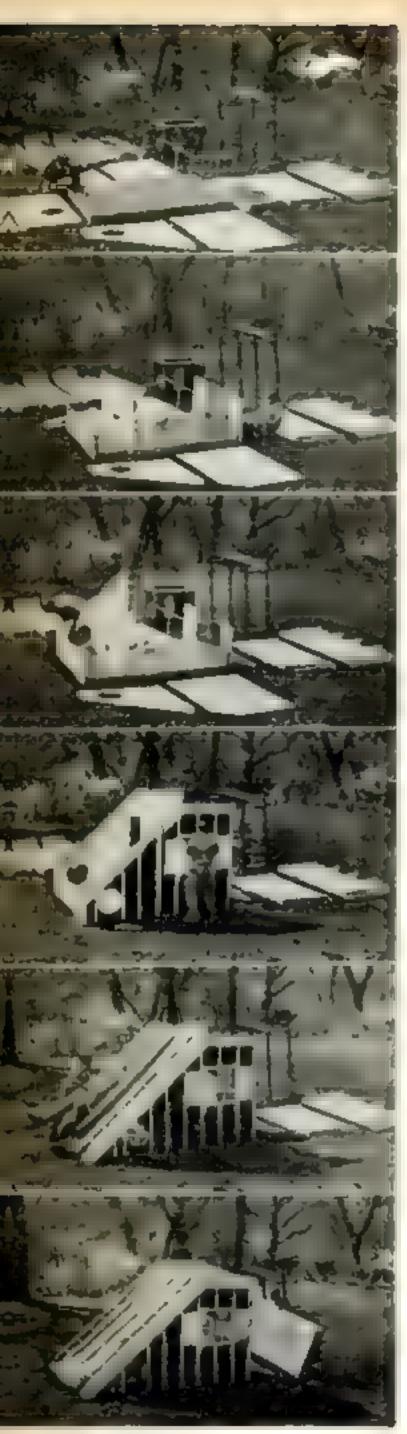
With the help of child psychologists, teachers, parents, and the kids themselves, Popular Science designs—

# The Best Playhouse You Can Build

By Joan Steen

TE DECIDED to build a playhouse with a difference—not a dollhouse to charm Grandma, or a tool shed to suit Dad But a practical playhouse, fun for kids. The kids have now okayed it. Many tried it. All loved it. The materials cost \$242, about half what you might pay for an equivalent store-bought playhouse alone—and you'd get no extra play equipment such as this one has built in.

We had a lot of questions at the start.



Prefab it indoors, assemble it on the site

KNOCKED DOWN, the house is a stack of parts that are easily handled. If you move, take it with you. Or store it in the garage during the winter. When your kids outgrow it, you could sell it to a neighbor and recover a good part of the money it cost



"How many birds?" "Ten," David says, A moment before Sinclair ("Sinny") was stretting the boat while David spied pirates, Later? Plane-spotting,



Kids were patient taking turns to crawl through the tunnel. They called the dark and snug tunnel a "very secret place."

What should you build into a playhouse to make it the most fun? How big should it be? For what age kids?

We asked nursery-school teachers, pediatricians, child psychologists. We called on the staff of the famous Gesell Institute of Child Development in New Haven, Conn.

Kids don't need much to have fun, we

were assured. Make the playhouse simple, but design the *outside* to be used as well as the *inside*. That way smaller children could use it as a jungle gym, while four- and five-year-olds (the ideal playhouse age) can explore its house-shop-fort possibilities.

A slide roof. So we took our cue from the deep-pitched roof of a New England CONTINUED



A rapt audience watches while Captain Hook leers from the hand of the chief puppeteer. Ramp up, the playroom's a puppet theater; down, it's a full stage.

A trike garage for some; a house, fort, or castle for others; the playroom's a flexible place. Tow-headed boy is more interested in swinging outside.

Sinny pays and David makes change as the playhouse window becomes a store counter. It's fine for crawling in and out of in "cops-and-robbers," too.

Sinny ducks through the tunnel as David hoists the door. If he lets go the rope, a clothesline tightener automatically grips it to keep the door from slamming.







SUCCISE: Assembled on the grounds of the Gesell Institute in New Haven, Conn., the POPULAN SCIENCE playhouse was an immediate hit with the children there—as you can see from these pictures. The youngsters swarmed all over it, trying the slides, the lookout, the turnel, the ladders. The Institute has added the house to its permanent play equipment.

saltbox and made the center of one side of the playhouse roof a slide—nine feet long, sloping at 41 degrees.

A divider down the center makes it two slides. It's fast, and the kids who tried it were thrilled. You might put a mat or cushion at the base as a safeguard, but most kids we saw—and that includes four-year-olds—caught on fast on how to get down gracefully.

A tower, too. The other aide of the roof we flattened out (allowing a little slope for drainage), and added a tower to it. It's anybody's tower—the battlement of a castle, the bridge of a ship (there's a wheel to turn), a widow's walk—or just a place to be high up and look out.

To reach the tower, what else but ladders? We saw little ones deftly maneuver themselves from the rungs of the vertical pieces onto the roof or into the tower. Older children can chin themselves or move hand by hand across the horizontal branch.

At ground level this slightly skewed saltbox has a four-foot-wide Dutch door

[Continued on page 220]



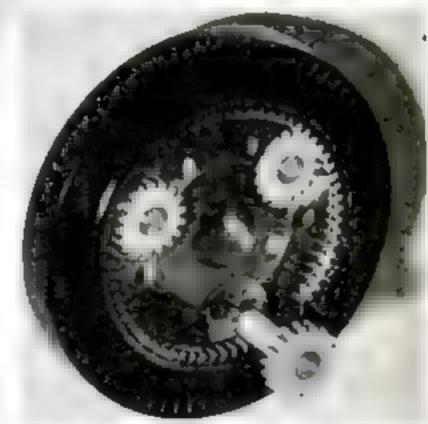


# ...these new collets are rubber

Now you can stop dreaming of equipping your lathe with a full set of collets and do something about it—and you won't have to put your lathe in hock, either, to buy them.

A set of 10 new synthetic-rubber collets just put on the market will handle all diameters of rod from  $\frac{3}{32}$ " to  $1\frac{1}{16}$ ". They're made by the Jacobs Manufacturing Co., West Hartford, Conn. (the same people who make the Jacobs key chuck for drills).

Ten of these Rubber-Flex collets cost \$65. You'd need 63 steel collets costing about \$325 to cover the same range. Of course, you'll need a collet chuck (\$70) and an adaptor (\$8) to screw it onto



THREE BOLTS with pinion gears for heads are rotated by the ring gear inside the handwheel to pull the chuck nose up tight on the collets. No drawbar through the spindle is needed.

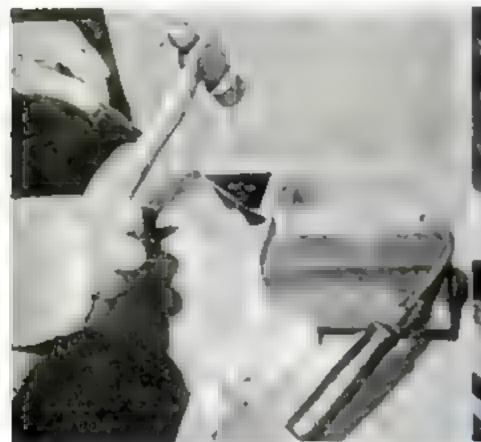
your lathe spindle, but you'd have to buy a drawbar and nosepiece, too, to use the steel collets, so you're still ahead.

The rubber collets have hardened and ground jaws molded into them. Because of their unusual flexibility, each collet size has a closing range of .100", as compared with only .005" range in steel collets. The jaws remain parallel as the collets are closed on the workpiece, providing maximum grip along their full length. They're tested for accuracy and have a maximum runout of only .001".

Because no drawbar is used, the full inside diameter of your lathe spindle can be utilized for long work. The collets are tightened by turning a handwheel on the chuck.—Herbert R Pfister.



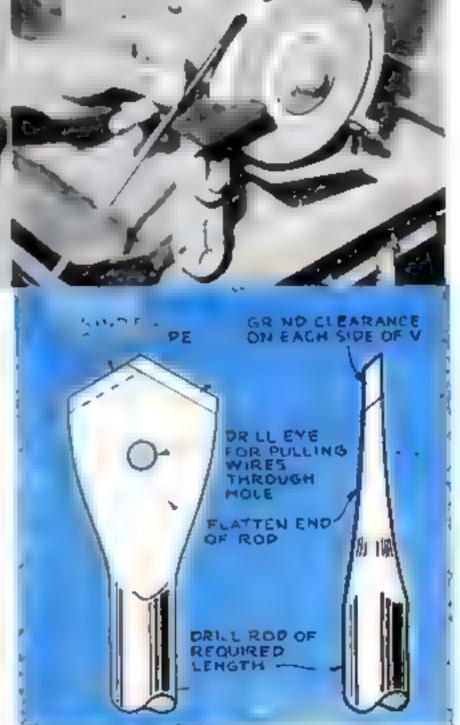
TO MOUNT THE COLLETS in the chuck, the nosepiece is removed and the proper collet inserted in a tapered hole in the chuck body.



### Make Your Own Long Drills

NEED extra-long drills for special jobs? You can make them up to 3' in length from drill rod of various diameters. Heat one end red and hammer it flat on the anvil of your vise until it is about "" thick. Grind a V shape on the end, keeping the point of the V centered; then grind slight clearance on each cutting edge. If you plan to use the drill for house wiring, drill a hole near the point to make an eye for pulling wires through framing.

Heat the tip red and quench it in water to harden it. Polish it bright and slowly heat it to a straw or blue color, depending on the temper required.—Gustav F. Hengel, Wayne, N. J.





NOSEPIECE is brought into position by turning the handwheel clockwise. The work is inserted before the collet begins to compress.



FINAL TIGHTENING is done with a hex wrench inserted in one of the three bolts with pinion gears. Turning any one tightens all three.

### Tool Tray Sheds Chips

Your lathe tools won't be buried under a drift of chips or flooded with oil if you keep them on a tray of expanded metal. Chips and oil will fall through the open mesh

Cut a length of the metal mesh to fit between the bed ways and place it low enough to clear the hold-on block under the tailstock.—H. J. Gerber, Stillwater, Okla.



### How to Dress a Reamer

A REAMER will produce an exceptionally fine finish if you lap the cutting edges lightly with fine lapping compound.

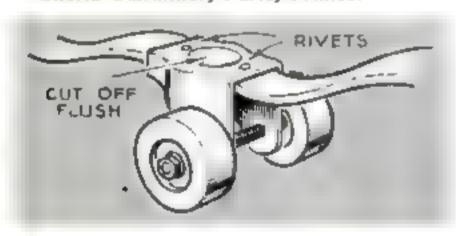
Dog the reamer between centers in the lathe and run the machine in reverse while you hold an adjustable ring lap lightly around the flutes.

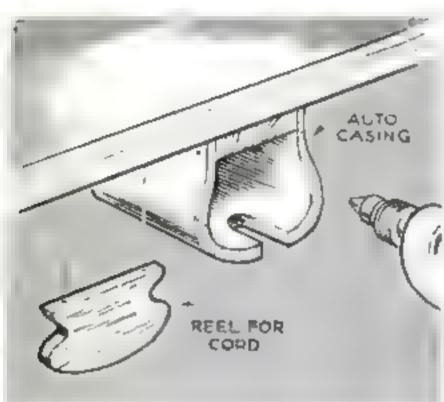
This method will remove only a few ten thousandths—not enough to impair the relief angle on the cutting edges—but it will clean away rust, metal build-up, and small nicks.—H. J. Gerber, Stillwater, Okla.



### **Luggage Skate from Casters**

You won't be at the mercy of porters if you make a luggage skate. Remove the wheels from two furniture casters and hacksaw off the top section of one axle bracket. File it to provide a flat top plate. Buy a leather strap long enough to be belted around your suitcase and just wide enough to fit flat inside the bracket. Center the bracket on it and secure with rivets. Attach the two wheels as below with a 4" bolt, washers, and two nuts.—Sheila Ostrander, Paris, France.





### **Holster for Electric Drill**

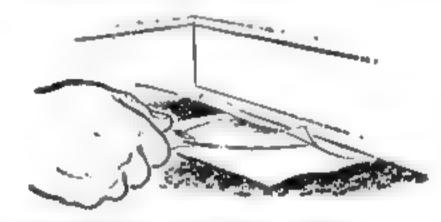
A same that keeps an electric drill within reach under a workbench can be made from a section of auto tire. Cut a slot to take the drill handle and remove the beads to form straight edges; tack these to opposite sides of a block and nail under the bench. A rack cut from 3/4" plywood can be provided for the line cord. Shape the rack as shown above.—

G. E. Hendrickson, Argyle, Wis.



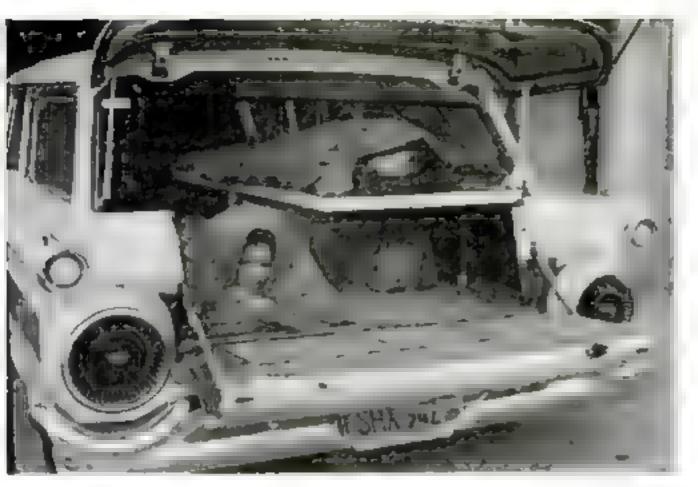
SMALL scratches through the silver coating on back of a mirror can be made nearly invisible if you apply a patch of aluminum foil to the back. Coat the shiny side with white shellac—not lacquer—and press it over the scratch, rolling with a furniture caster to secure an even bond.

—Ken Murray, Colon, Mich.



### Protect Carpet from Paint

Watt-to-wall carpeting can be a problem when it comes to repainting the baseboards. My solution is to insert folded paper or aluminum foil along the edge, between molding and carpet, with a wideblade scraper or putty knife. Once the paint is dry, I press the blade between the paper and the molding edge to break the paint seal, then pull the paper out. —R. F. George, Riverdale, Md.



You can ease family travel with a—

## Station Wagon Bunk Bed

MITERED CORNER

### By Henry V. Lukas

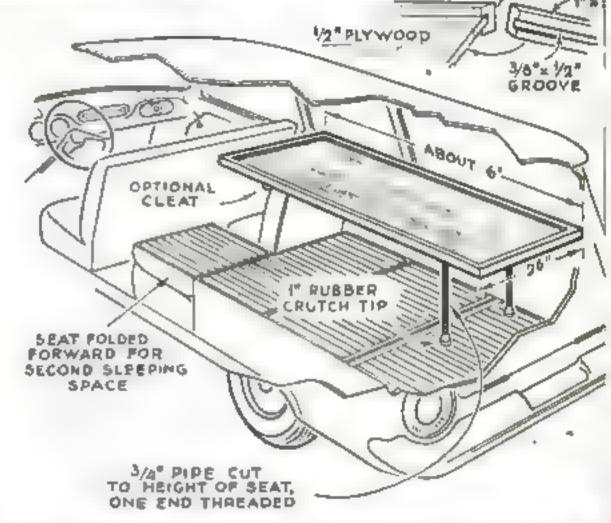
how to sleep two in my station wagon and have room for supplies and equipment, too. The solution took the form of a simple bunk bed that cost only a few dollars. It increases useful floor space by 50 percent.

I planned the bunk to rest on top of the second seat at the front end. Two pipe legs at the other end make the bed level. The bunk is just over 6' long and 26" wide, Most recent wagons will handle this size. The width leaves room on the floor alongside for a second sleeping bag

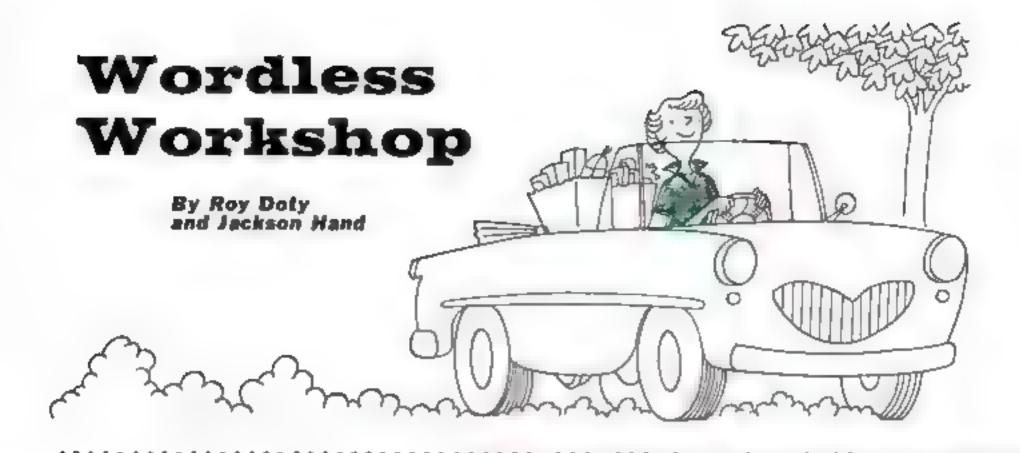
Under the bunk you have a useful storage area. I've found it will handle almost everything we need on a campout.

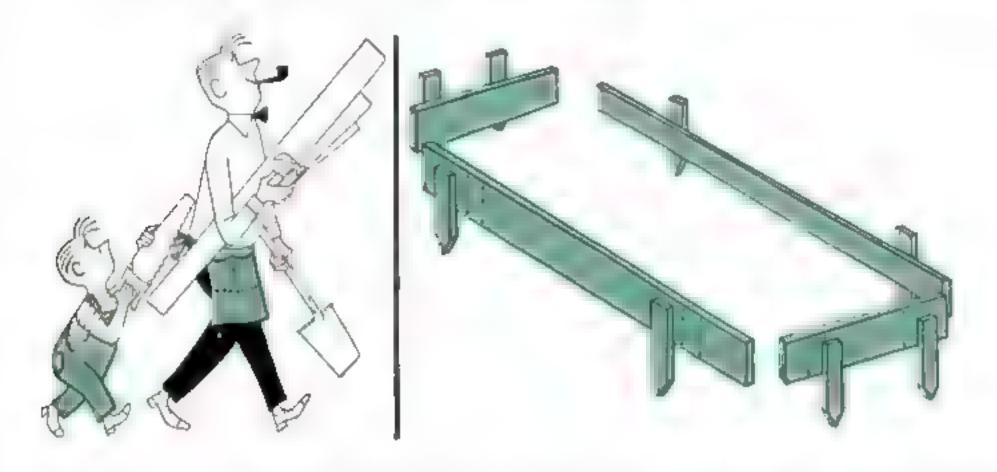
I toyed awhile with the idea of making the bunk fold in half. But we find no need to take it down. It would be a simple matter to put a hinge in the middle, if you want foldability.

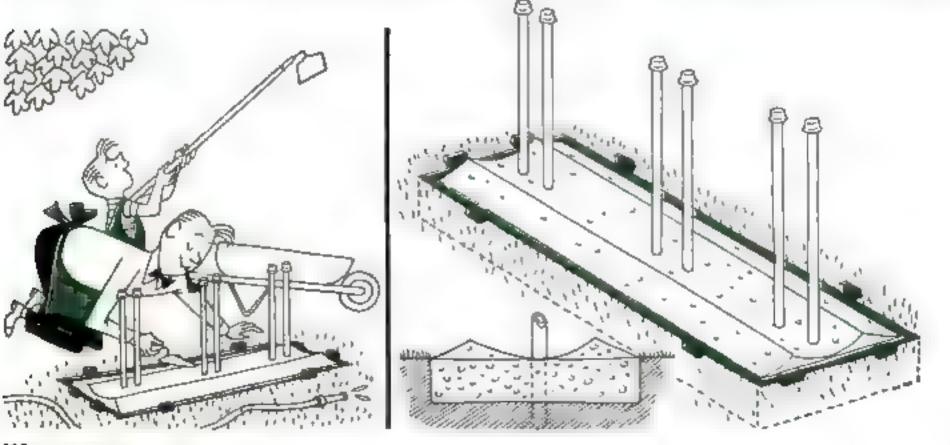
TWO PIPE PLANGES on the underside near one end hold the screw-in pipe legs. Bore pilot holes, as you see here, for the screws that will hold on the flanges.

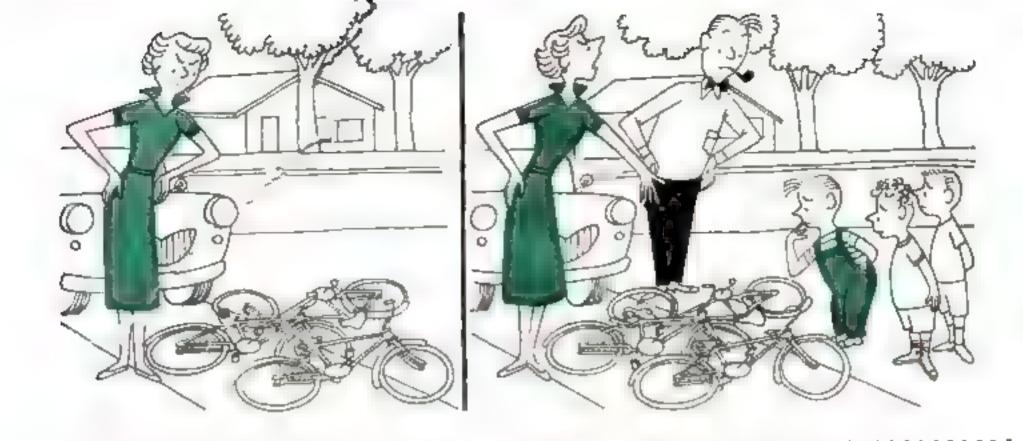


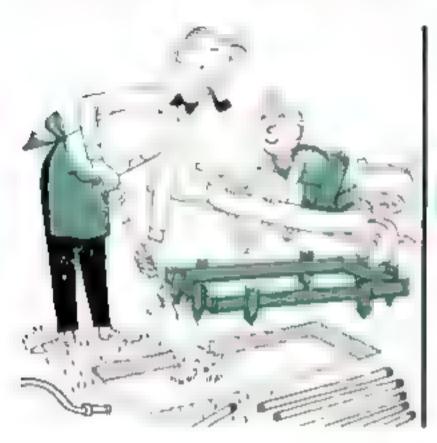


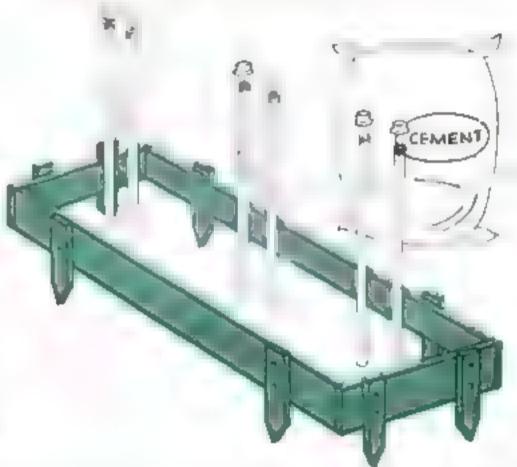




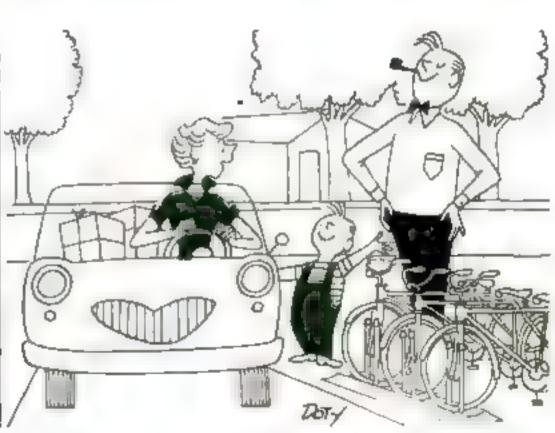


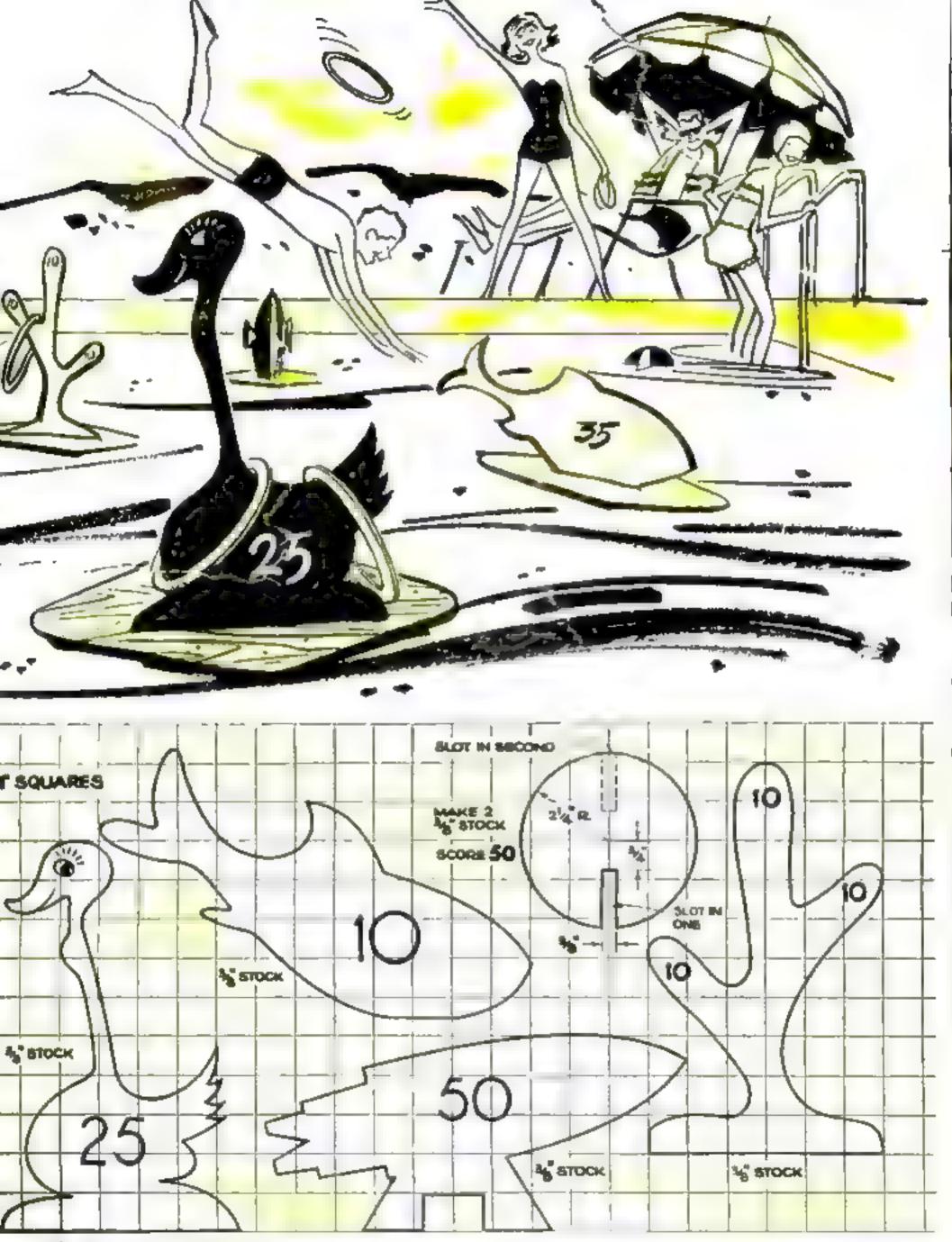












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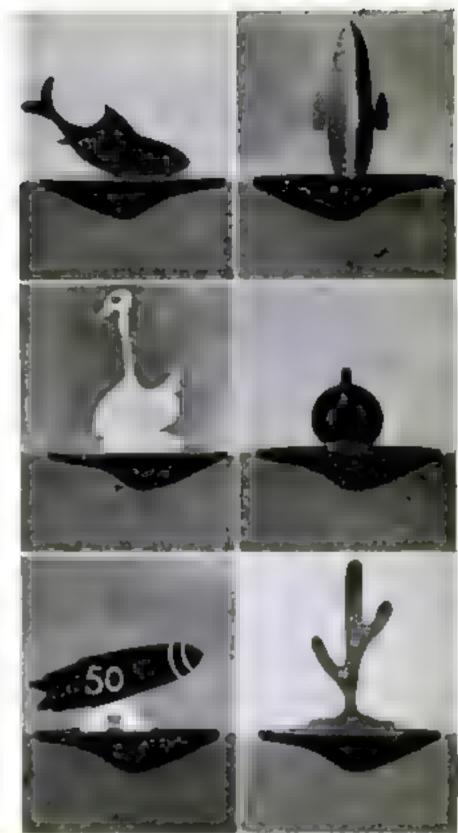
How to jigsaw fancy targets for a-

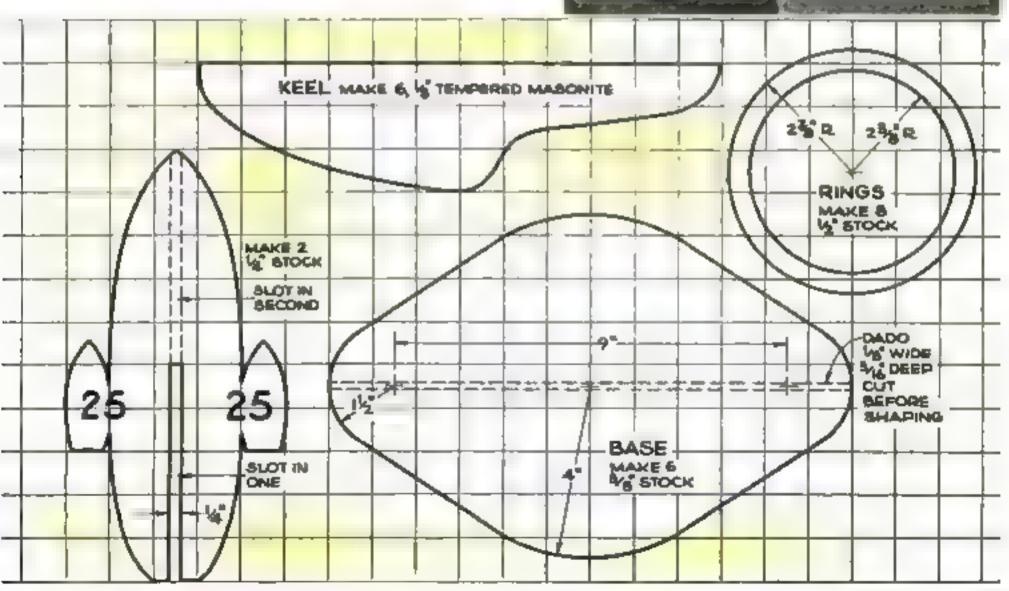
# Ring-Toss Water Game

By R. J. DeCristoforo

NCE you've made this water version of the old ring-toss game, you'll have just the incentive you need to install that back-yard swimming pool. If you don't go for that, the game can be just as much fun on a lake or stream. Or you can even have a landlubber's version, simply by leaving off the keels.

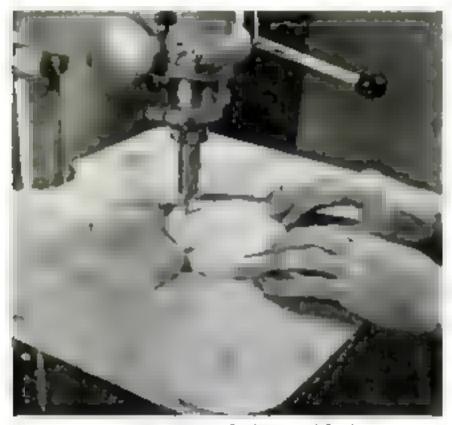
With a little practice you can develop an easy skill in ringing the targets at considerable distances. Light fishing line, attached to each ring through a small acrew-eye, lets you pull in the target or retrieve the ring after a miss. To make the game tougher, rule that a score doesn't count unless the target is brought to the







DRAW TARGETS ON WOOD or make paper patterns of them. Cut them out with a jigsaw or coping saw and sand all the edges smooth.



CUT OUT INNER DISK of rings with ¼" router bit at a speed of about 5,000 r.p.m. Cut half thickness on one pass and turn stock over.



PAD-SAWING precut blanks on a bandsaw is a fast way of cutting duplicate pieces. Bases for the game targets are being sawed above.

edge of the pool without tipping over.

The scinner is the person or team that scores the greatest number of points after a fixed number of tosses. Or you can establish a definite score and the first to reach it wins. Each arm on the cactus is worth 10 points, so that target can score 10, 20, or 30 with one toss, depending on how many arms the ring encircles.

You may rule that the score you set must be hit right on the button, making careful target selection necessary. Ringing a target that puts you over the winning figure then halves any points you've accumulated. The player must always toss from the side of the pool, using the one farthest from the target chosen. If the target is more than half a pool length away and the player elects to toss from an end of the pool, he gets double the score marked on the target—if he rings it.

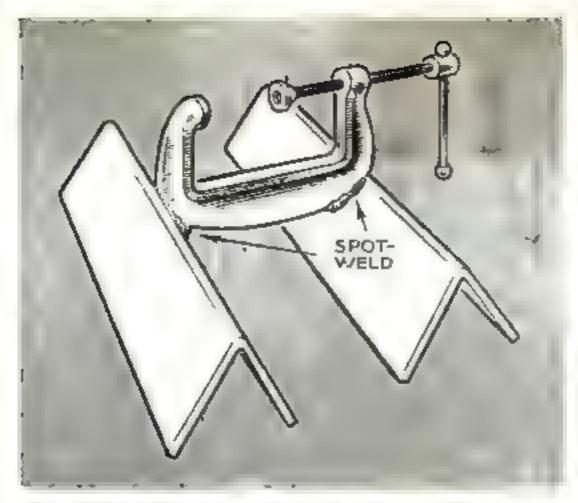
Making the targets. Use waterproof plywood (and tempered hardboard where shown). For the bases, keels, and rings, cut the stock to overall size and then stack for pad-sawing on a bandsaw. You can do this on a jigsaw, too, but the stack can't be as thick. Be sure to cut the dadoes for the keels before you shape the bases. Most regular saw blades will cut the \( \frac{1}{6}'' \)-wide dado.

Attach the targets to the bases with waterproof glue and two finishing nails driven up through the dado in the base. Targets should be on center with the dado but the weight balance is not critical. Use waterproof glue to set the keels in place.

Use a plastic finisher as an undercoater for all parts, and lacquer.



BRUSHING ON GAY LACQUERS isn't disheult if you use a retarder to delay drying a bit. Quick-dry lacquers will do it in one sitting.

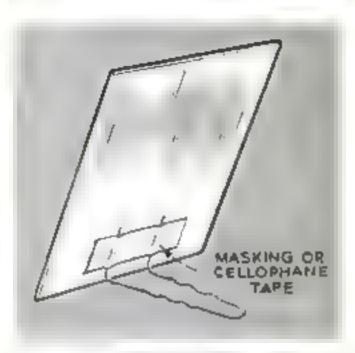


### Here's an Expendable Welding Vise

An INEXPENSIVE C clamp and two pieces of 1" angle iron 8" long make a rugged vise for the welding table. The clamp is placed between the inverted angles so that the best contact for welding is provided. When the vise is burned up, as it finally will be, it can be replaced with another at nominal cost.—M. R. Walker Ir., Danville, Ill.



# Short Cuts and Tips



### **Hairpin Photo Stand**

Instead of propping a small, unframed photograph or snapshot against some knickknack, make it free-standing by taping the ends of a bent hairpin to the back.—G. E. Hendrickann, Argyle, II is.

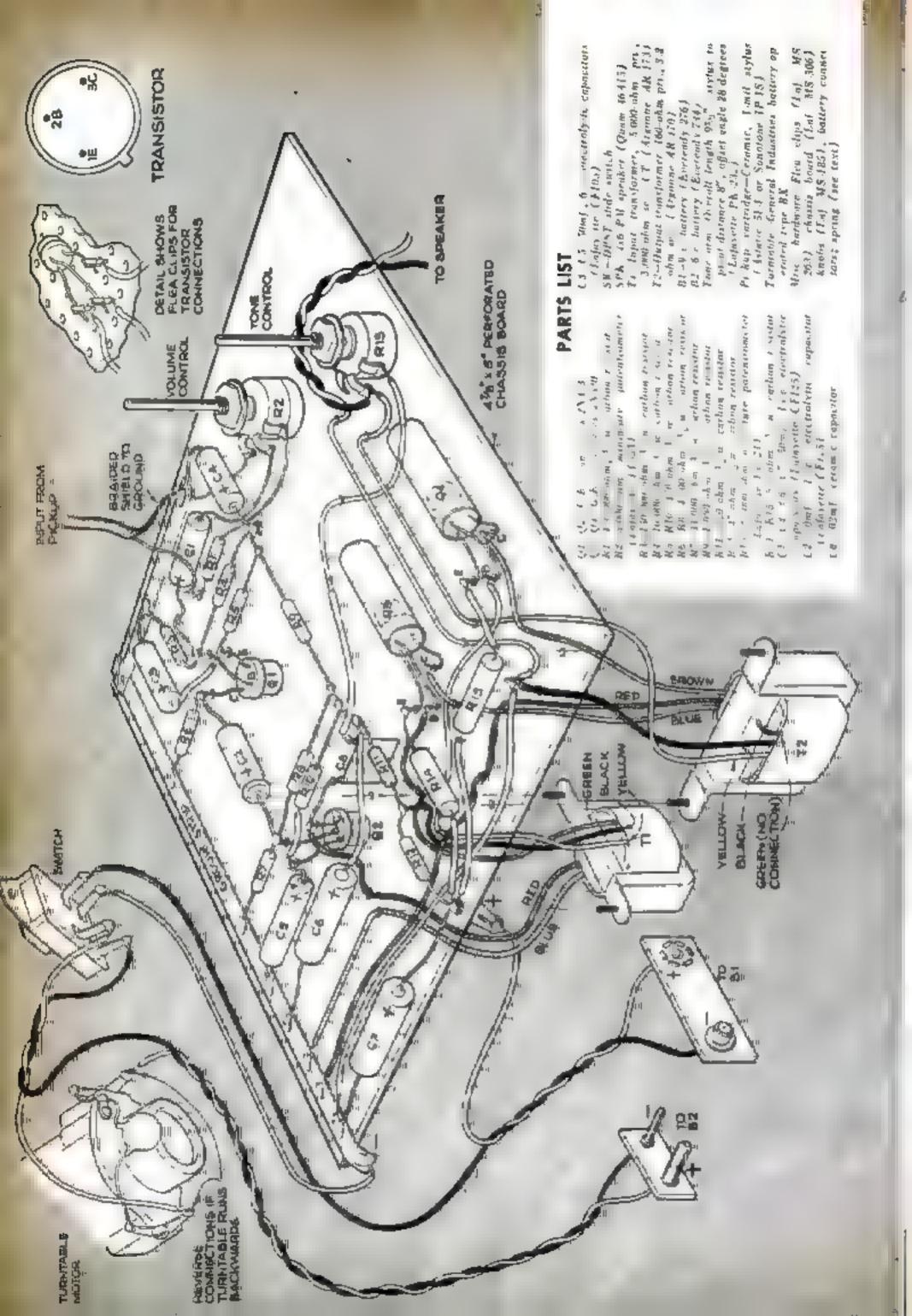


### Plane Hardboard for Gluing

When you are gluing single-faced hard-board to a wooden frame, planing the "screen" side smooth will give a better glue bond.—Jackson Hand, Westport, Conn.

### Oil-Drum Tool Stand

An EMPTY 55-gallon oil drum partly filled with sand or gravel will serve as a sturdy base for a drill press or other power tool that requires a stand.—Wilber H. Fulker, Colorado Springs, Colo.



# Portable Phono Plays Upside Down

Tipped, tilted, or level—it plays any way, anywhere.
You can't buy it yet, but you can build it from PS plans

### By Howard McEntee

Your can have music wherever you go—and of your own choosing. This truly portable phono plays anywhere: in a car, on a boat, at the beach—even flying upside down in an airplane if that's your whim. A tricky tone-arm arrangement keeps the needle in the groove even when the machine is tipped at ridiculous angles.

There's ample volume for easy listening even in noisy locations. Although the sound is not high-fidelity, it's pleasant—cleaner than many AC portables labeled hi-fi. Total operating cost is between a cent and a half and two cents an hour. You can build it in two or three weekends and it won't cost any more than many ordinary portables that must plug into AC.

The case is homemade of tempered hardboard. The turntable



RECORD IS STILL PLAYING even with phono tilted like this. Photo at left shows "works" inside case. Motor board is hinged—lifts up for easy battery replacement. Amplifier chassis is screwed to wooden motor-board stiffeners. Turntable motor (near corner) runs on six volts, Built-in governor regulates turntable speed.

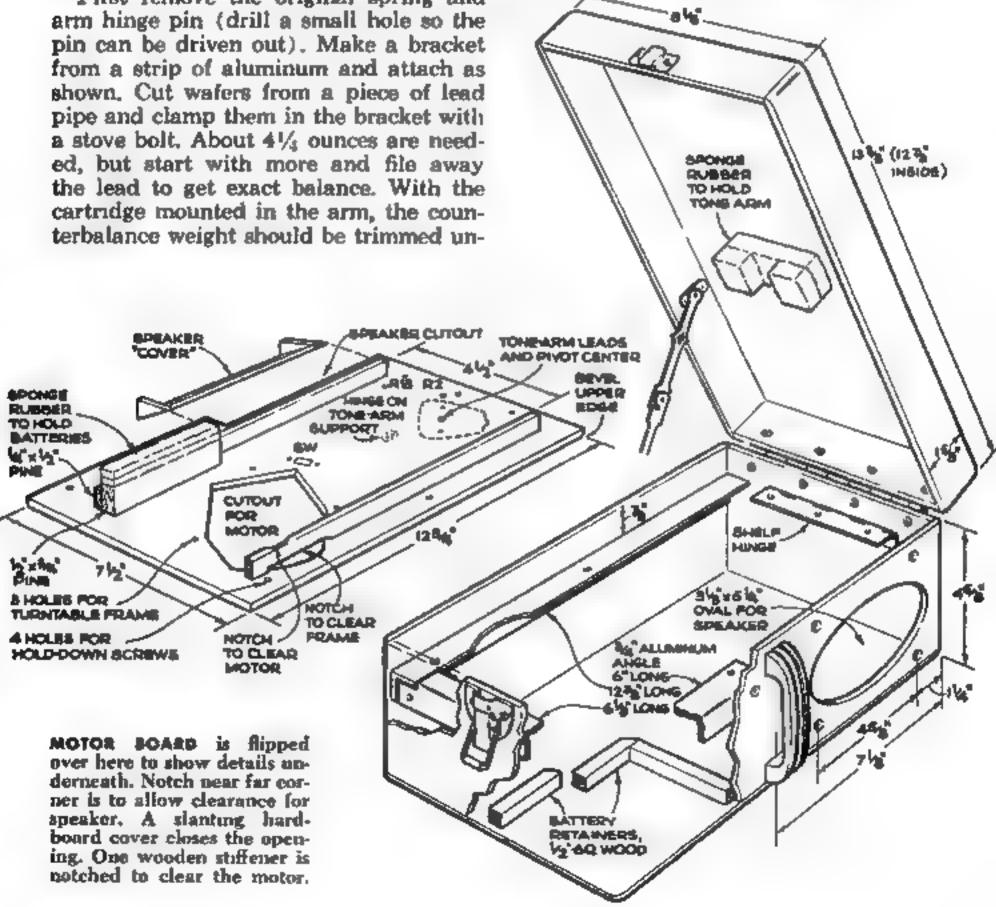
and dry-cell-powered motor are purchased as a ready-made unit. The tone arm is an inexpensive type that you modify according to instructions. You build the transistor amplifier.

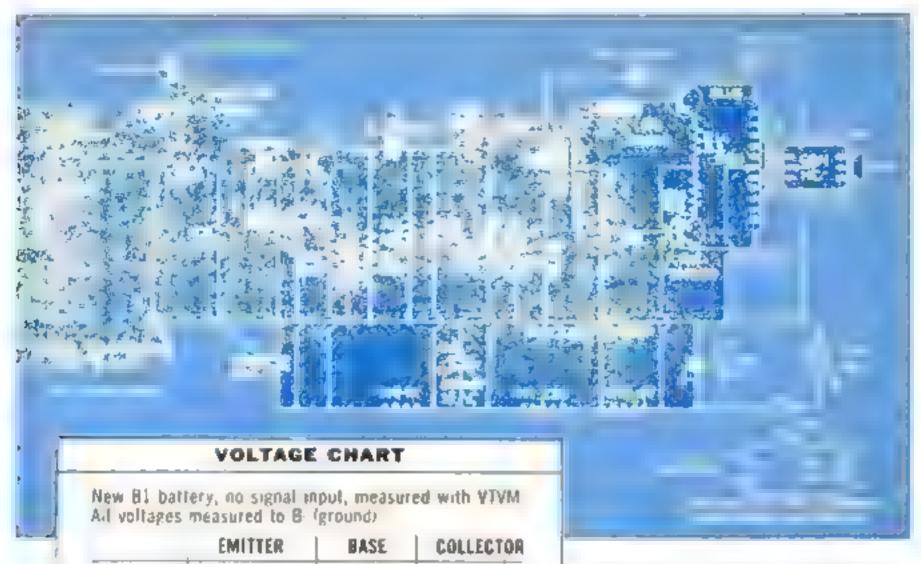
The tone arm. The conventional tone arm depends on weight to hold the needle on the record. Part of this weight is counterbalanced by a spring, reducing needle pressure to an acceptable amount. Switching the role of the spring is the secret of the surprisingly well-mannered behavior of the modified arm. The arm is balanced precisely until there is no force downward on the needle due to gravity. Then a light spring is arranged to pull the needle down with just the right pressure.

First remove the original spring and ed, but start with more and file away

til the ann was not swing no matter how the base is tipped.

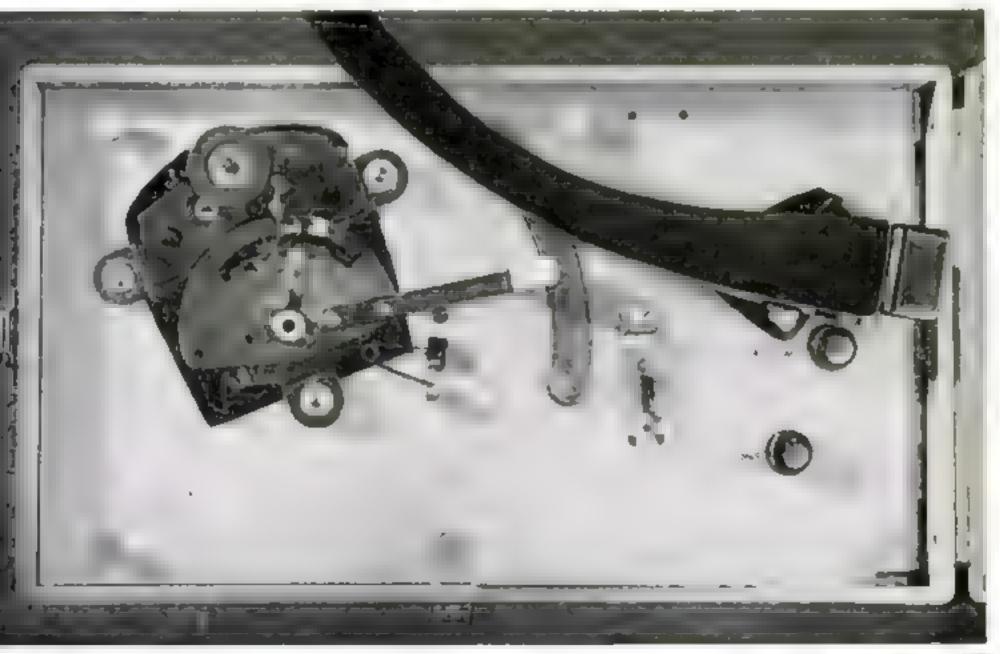
Before pushing the hinge pin back in place, rotate the pivot assembly 180 degrees so that the tab that held one end of the counterbalance spring is toward the cartridge, Bend the tab down until its tip is about 5/16" below the level of the hinge pin, then reassemble. A new, lighter spring will be needed. The one used here came in a Walsco #7421F spring assortment. It should be able to give about eight grams' tracking force within the range of adjustment. Adjust the pickup cartridge in the arm so its axis is at an angle of 28 degrees to an imaginary line joining the pivot point of the arm and the stylus. With this off-

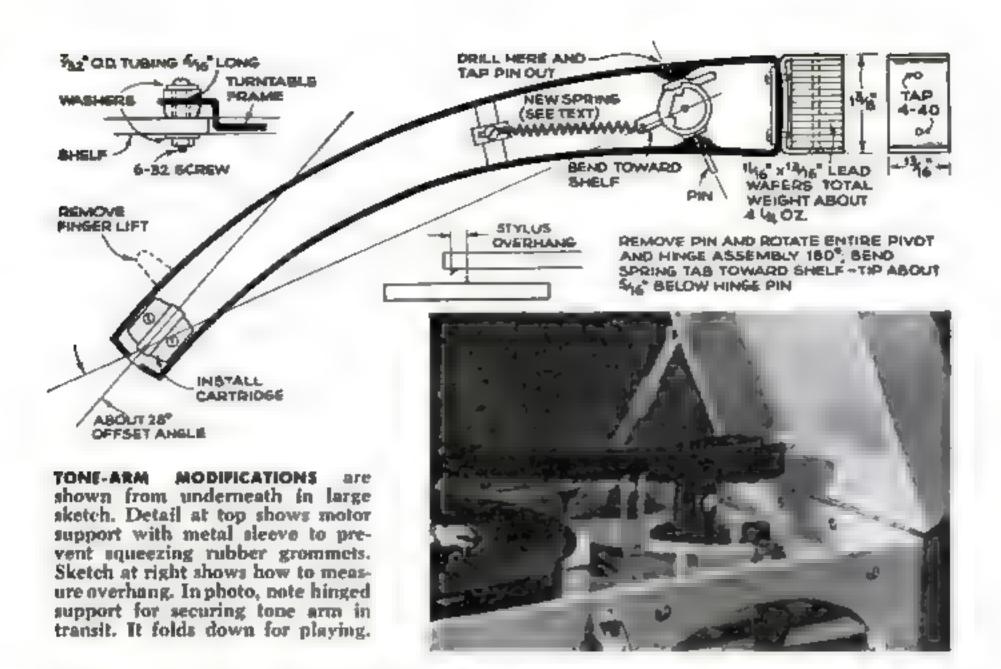




Q1 18 76 30 02 78 77 79 03, 04 94 93 barely readable 9.4 volts to B 93 to unction of R11 and R12 86 to junction of RT1 and R9 to junction of R9 and R4 80

and voltage chart are useful if your rig ever needs servicing. Below: Top view, with turntable platter removed, shows placement of parts. Note detail of spring-loaded switch and placement of speaker cover.





set angle, the arm should be mounted so the stylus overhangs the turntable center 25/32".

The transistor amplifier. The amplifier is assembled on a chassis of perforated phenolic material. Transformers, transistors, volume control, and tone control are mounted on one side. Most of the resistors and capacitors are on the other side of the board, held in place by their leads. A piece of brass shim stock attached along one edge and part of another simplifies making the many "ground" connections.

Flea clips are used for transistor connections. To avoid heat damage, complete the soldering before the transistor leads are inserted. Be careful here—don't let solder run through and fill up the end where the transistor leads are to be inserted.

As an extra precaution, the poweroutput transistors are provided with heat sinks to help dissipate heat. Cut two pieces of 3/8" copper tubing 1" long and split them on one side. Spring them open just enough to make a tight fit and slip them over the transistor cases.

Turntable and switch. The turntable control lever usually comes mounted on the wrong side for this application. Re-

move the rivets and remount the lever as shown in the photo on the preceding page, using alternate mounting holes provided. Alter SW, a DPST slide switch, to remove the detent action. Simply bend back the tabs holding the switch together and reverse the thin metal plate inside that provides the detent. Drill a hole in the knob to receive a spring made from a cut-down safety pin. This switch will be mounted so that the spring forces it "on" when the turntable control lever is moved from the "off" position.

Laying out the motor board. To keep the unit compact, little leeway is allowed in the dimensions for clearances. It's wiser to lay out the parts on cardboard. mount them temporarily, and check clearances. The lid should clear the tone arm when the stylus is in the first groove of a 7" record. Check the lid support for interference with a 12" record, With your cardboard template as a guide, cut the permanent motor board from 1/8" tempered hardboard. Glue the wood stiffenera in place as shown. Sponge rubber, cemented to one block, holds the batteries in place when the motor board is tightened down.

Mount the turntable with machine

[Continued on page 222]



# 20-Buck Dinghy for the Kids

By Henry Clark

hm z 4' z 8' Exterior Plywood A-	
3/4" = 1 5/8" = 36' Mahogany (Ch: Rub Rails)	
3/4" x 2 5/6" x 6' Habogany (Bot)	tons) 120
3/4" x 14" x 6" Spruce (Sow, Tre	mace) 2 23
1 1/8" x 9% x 4" Yort, Grain F: Stepping (Seat	175
3/4" x 1 5/6" x 20" Clear Redwood (Youl, Cleat	)
3/4" No. 6 Galv. Screws-2 Gross	205
Zgo No. B Galv. Screws-8	15
Ribbed Soat Mails-1 1b.	55
Waterproof Glus-1 1b.	105
	\$ 1935

Dad, too, can use this sturdy, 35-pound lightweight—as a car-top fishing skiff or as a tender for a bigger boat

OR \$20, give or take a buck, you can easily put together this eightfoot dinghy—most of it from a single 4'-by-8' panel of 1/4" plywood. Though lumber and labor are cut to the bone, you still come out with a durable, stable boat that will do 12 m.p.h. with a three-hp. outboard.

The exterior-plywood panel can be bought for about \$6 at almost any lumber yard. On it you lay out the two side and three bottom pieces. Cut out the sides first with a hand- or portable-electric

saw; leave the bottom pieces until later. Then shape bow and transom from 3/4" spruce boards. You will probably have to butt separate pieces and glue them together. Side edges on both pieces must be beveled—five degrees on the bow piece, 15 degrees on the transom piece.

Now begin assembling the dinghy on the simple jig of two-by-fours shown on page 150. Set the two side panels in place, tacking them to the jig blocks on the transverse beam. The bow and transom go on next, top edge down, at right angles

### Sides and bottom come from one plywood panel



TWO SIDE AND THREE BOTTOM PIECES just fit. Thicker plywood (5 16" or 3 8") would make a stronger boat but one with less freeboard.

JOINTS BETWEEN SIDES AND ENDS are scaled with linen strips soaked in glue. Tightening screws squeezes linen between pieces of wood.



ROPE HOLDS SIDES TO BOW while screws are driven. Sides are tacked to the ends to position them first; then pilot holes are bored.



chines are clamped to protrude ¼" above side edges. After pilot holes are drilled, chines are removed, swabbed with glue, and reclamped.

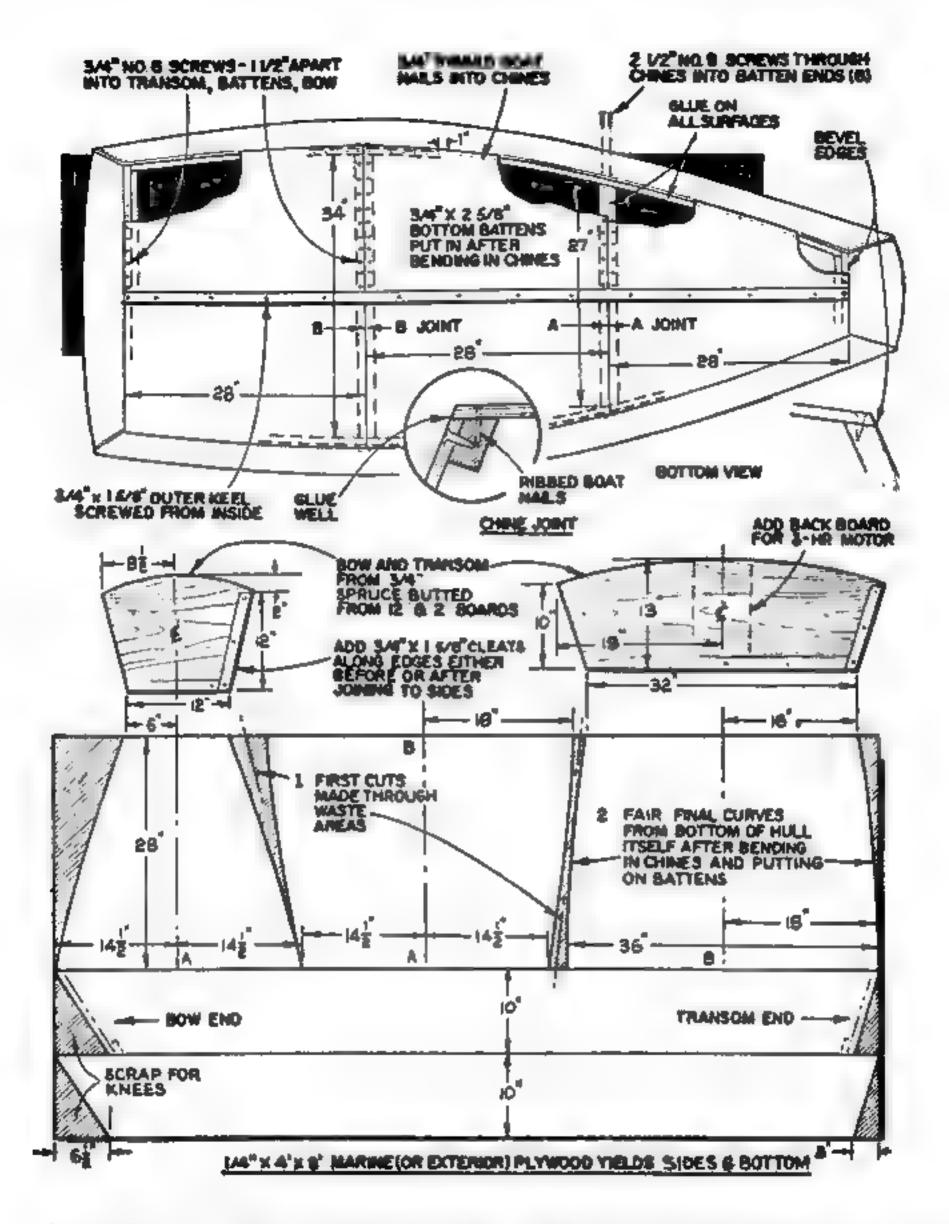


CHINES ARE BEVELED to get them even with the side edges. As they're planed, the surface is checked for flatness with a long stick.



to the jig's main beam. Tack the side panels to them temporarily. Then nail struts on the bow and transom to brace them in place against the floor.

After the sides and ends are lined up and nailed loosely together, fasten them permanently. Drill pilot holes for screws through the sides into the bow and transom pieces. Then pull out the temporary nails, one joint at a time, gluing and screwing each joint in turn. Apply two coats of glue along the joints before you run screws in. Let the first coat soak in and dry; apply the second to both sides of a linen strip. The strip is squeezed between side and end piece, filling the



Chines go in next. Like battens and rub rails, they are of mahogany. This wood bends without cracking, holds screws well, and is easily planed. Use the cut-and-try method to make the chines lie flat against the boat's sides. Bevel front and rear ends to fit, and

clamp the chines in place so 1/4" protrudes above the side panel. Drill pilot holes through the sides into the chines, unclamp them, and swab with waterproof glue. Reclamp chines and drive in screws.

To make a flat surface for the bottom pieces to rest on you must bevel the chines and the bottom edges of bow and

### Adding the bottom panels and rub rails completes the hull



BOTTOM IS SCREWED ON over glue-soaked linen strips that fill voids. The pieces are fastened to the chines, battens, bow, and transom.



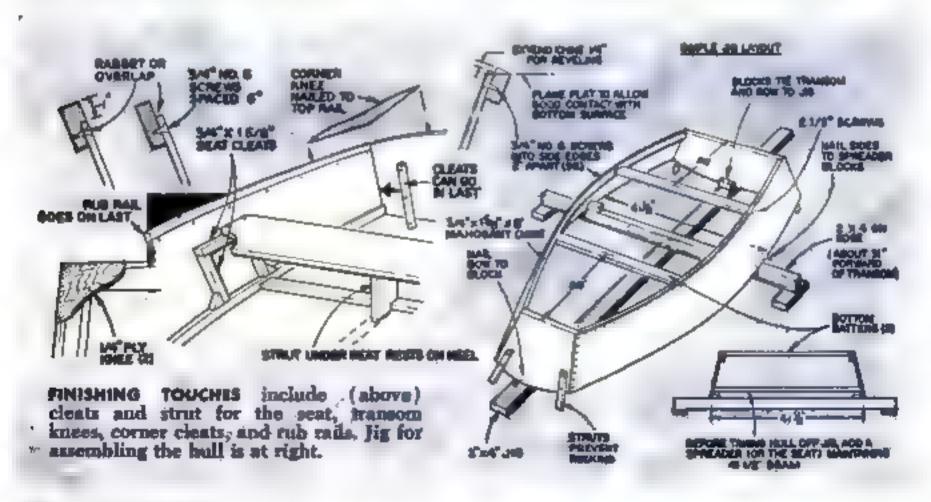
RUB RAILS ARE CLAMPID to the gunwales and screwed in place. They can be rabbeted, or left plain and lapped over the gunwale.

transom. Check them with a straightedge as you plane, to even out dips and rises. Then fasten the battens in place by driving screws in through the chines.

Cut out the three bottom panels and line them up on the hull so they butt tightly over the battens. With a few screws positioning the bottom pieces, scribe the hull outline on them by running a pencil along the chines from inside the boat. Remove bottom pieces. trim them to within 1/8" of the scribed lines, and replace. Drill pilot holes through the bottom into battens, chines, bow, and transom. Remove panels again to apply glue. Glue and screw one panel down at a time. When the glue has dried thoroughly, plane the chine edges flush with the sides.

Lay on the outer keel and scribe its outline on the bottom. Remove the keel and drill pilot holes through the bottom between the lines scribed. Now glue on the keel and drive screws through it into bow, transom, and battens. Flip the boat over and drive more screws, through the pilot holes just made, into the keel. Put the seat in to maintain a 411/4" spread between gunwales; remove bracing.

Finish up with rub rails along the top edges of the sides, two corner knees at the transom for rigidity, cleats in the corners, and seat braces. Glue a clamp board to the outside of the transom if you plan to hang on an outboard motor. Before painting, cover the boat inside and out with two coats of Firzite.





Removing wallpaper is no longer the tedious, messy job it used to be. Now you can rent a small, portable, home-size steamer that peels off the paper for you. The combination of heat, moisture, and pressure loosens the paper much faster than the old method of soaking it with water.

Until recently, the only steamers available were complicated machines for professionals only. The new units are trum little home appliances as safe and simple to operate as your wife's pressure cooker. You can rent one for \$3 to \$5 a day at many paint, hardware, and tool-rental stores. In a day's time you can do up to two complete rooms.

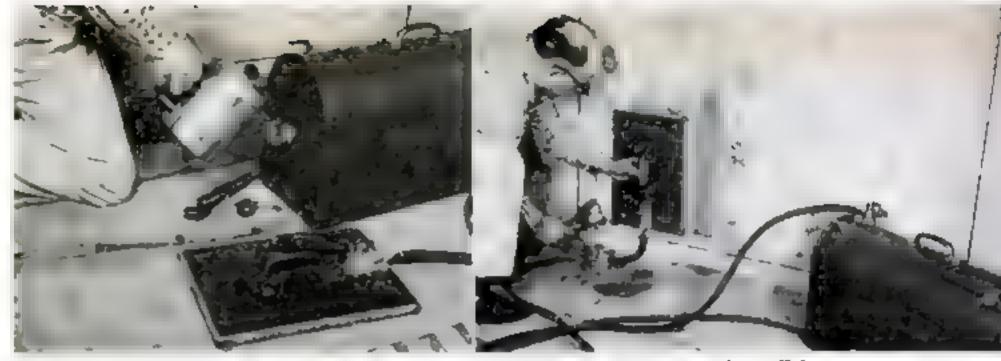
One manufacturer of the new steamers sold 15,000 units last year alone to stores planning to rent them. Tool-rental agencies all over the country report that the home wallpaper steamer now ranks third or fourth on the list of most frequently rented tools. You should be able to find one in most fair-sized towns. If not, it

may be worth a trip to a neighboring city.

How they work. There are two common types of home steamers. The smallest and lightest is the all-electric model. It weighs about 35 pounds, is easily carried, and fits in any car trunk. It is particularly well suited to home use as it draws only 10 amps and can be operated on ordinary house current. You just plug it in and the rest is automatic. It turns itself on when heat is required and off when sufficient steam pressure has built up. Safety valves insure that the steam can't get out of hand.

This type holds about six quarts of water—enough to do a 12'-long wall. There's a waiting time of about 20 minutes between fillings to build up steam, but you can shorten the time by filling the tank with boiling water instead of cold.

"Kero-electric" steamers burn kerosene to create steam, while a small electric motor maintains proper fuel flow.



PILING THE STEAMER with water is the only preparation required. Completely automatic, this all-electric model keeps steam at the proper pressure and shuts itself off when the water level drops too low in the boiler.

pressing the PAN against the wall forces steam out holes and into the paper. Start at the bottom of the wall and work upward so the rising steam helps to loosen the paper above. Trigger on the pan controls the flow of steam.

These have more capacity than all-electric models. They hold 4½ gallons of water and can provide steam steadily for hours without a halt. They weigh about 60 pounds, but can be taken apart for carrying.

If the burner is operated correctly with a blue flame, the kerosene will not give off odor or soot. Windows should be kept open, however, when using any steamer to prevent excessive accumulation of moisture in the house.

One disadvantage of a steamer is that it can't be used if you have a papered ceiling that you want to protect. The steam, rising from the walls, will loosen the paper on the ceiling.

Applying the steam. A flat pan with a long hose carries the steam from the boiler to the wall. You hold the pan against the wall and the steam flows out through small holes in the underside.

A trigger on the pan's handle lets you control the flow of steam. You hold it on for about half a minute, then shift the pan to another spot while you strip off the softened paper with a putty knife. You work with both hands—one to hold the pan and one to scrape—because the paper dries very quickly.

Stripping off the paper. Scrape carefully at first with the putty knife to see if the paper is loose. Watch your step on plasterboard walls until you're sure that the paper will come off without pulling away the surface of the plaster-board with it.

Try to slip the blade under the bottom

layer so you remove all of the paper at once, instead of a layer at a time. Scrape off small specks immediately before they dry and harden.

If the paper fails to come off easily, give the spot a few extra shots of steam. After a few minutes, you'll get the feel of just how long to keep the pan on one spot for best results with your particular wall condition.

Because some steam escapes from the pan and rises along the wall, it's best to start at the bottom and work upward to get the benefit of its loosening action.

Wash down the stripped walls with clear water and a sponge and sand off any paper specks that remain. Then fill any small cracks and dents with patching plaster.

You can put new paper over old provided it's sound and there aren't too many layers. The best rule: If there are three or more layers already on, or the wall is cracked, remove the old paper first.

Paper that has built up to more than three layers thick is not likely to provide a smooth and durable foundation for new paper. In the end, the new paper will be ruined by the worn or cracked old paper and it, too, will have to come off

Souking the paper. You can also use the brush method, which works well except that it's slower and messier than steaming. Use hot water and brush it on one entire wall at a time, working from the top down. Some people prefer to use a pump-type garden sprayer to



WORK WITH TWO HANDS, holding the steamer pan with one and scraping with the other, to speed up the job. Where possible, use downward scraping strokes, as at center above, so that the paper's own weight helps to peel off the strips.

Unusually hard-to-remove spots may need a second burst of steam. Clean up as you do each wall, rolling the scraps into newspaper (above, right). This way, you'll avoid tracking sticky bits of old wallpaper through the house.

apply the water, but the brush method gives better control.

If there are many layers of paper, it may take three or four brushings to soak through sufficiently. If you find any spots that seem to dry out too quickly, scrub them with the brush to break through surface grease.

Chemical wallpaper "removers" do not in themselves take off the paper. They are wetting agents that make the water penetrate the paper more readily. Some additives are really detergents that cut through greasy coatings. Such chemicals are useful and inexpensive, though not always necessary. If you use them, add them to the water according to the manufacturer's instructions.

When the paper is soaked enough to penetrate and soften the glue at the back, it is then stripped off the same way as in the steaming method.

Removing ceiling paper. If you have only the ceiling to do, it's doubtful whether holding a steamer pan overhead is much faster or easier than the brush-soaking method. But if you have both ceiling and walls to do, steamers are ideal because of the extra loosening action of the rising steam. Do the walls first, and by the time you reach the ceiling a good part of the removal job will have been done for you.

Work across the narrow dimension of the room and you'll find that you won't have to shift the ladder as often. Some workers prefer a large paint roller or a pump sprayer for soaking a ceiling. Working steadily, it takes about three hours to do a 12'-by-15' ceiling.

Unsticking materproof papers. The thin plastic coating on waterproof papers poses a tough problem because the water can't get through to the paste. You can't put new paper over it because the slick surface offers poor adhesion. If you're not sure whether the paper is the plastic type, test it with ink or some oil. If the paper becomes stained, it is not plastic-coated.

There are several ways to break the plastic surface. One is to sand off the thin coating (you could use a power sander of the orbital type, but don't try it with a belt sander.) Hand sanding is slower but quite effective. Another way is to scrape the surface with a cheese grater or slash it with a razor blade. Make long crisscross slashes across the wall a foot apart, working from top to bottom.

A steamer, or repeated brushing with water, should now penetrate sufficiently to loosen the paste. The paper may come off in small diamond-shaped pieces, but the job will go quickly nonetheless.

Textile-backed wall coverings (Sanitas, Walltex, etc.) are the easiest to remove as the cloth simply is pulled right off the wall without any steaming or soaking. Start at any corner or along a molding where you can get an edge of the knife under the covering and pull slowly to the side.

There are a few precautions: Don't pull straight out. Ease the covering off

# How to patch a bad spot

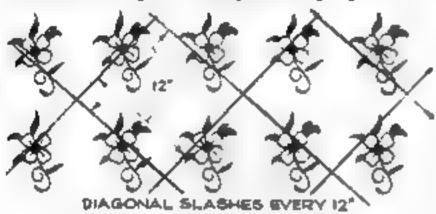
OVERSIZE SHEET LAID
OVER BAD SPOY

OUT THROUGH BOTH PIECES WITH RAZOR BLADE

NEW PATCH EXACTLY FITS
CUITOUT OF OLD PAPER

LAY NEW PAPER over a torn or soiled spot in the old paper and cut through both layers at the same time with a razor blade. Soak the area with warm water to remove the bad spot, then paste the new paper in its place. You'll find that the patch makes a perfect fit.

# Unsticking waterproof paper



WATER?ROOF PAPER won't let moisture reach the back and is thus hard to remove. Make diagonal slashes every 12" with a razor blade and these will let the moisture seep through.

in a direction parallel to the wall to avoid breaking out lumps of loose plaster and to minimize tearing off threads that stick to the wall and must be scraped off separately. If you do come across any stubborn spots, dampen the back of the paper with water.

In some cases, glue is added to the wheat paste for this type of covering because of its considerable weight compared with paper. If freeing the covering from the wall is very difficult, it may be necessary to alash the surface coating and resort to soaking or steaming.

What to do if it won't come off. Unprimed plasterboard walls are very hard to strip because the wallpaper won't separate from the plasterboard's paper skin. The soaking and scraping often tears off the skin and disintegrates the plaster underneath.

To prevent this, new plasterboard should be primed with a coat of flat oil paint, latex paint, shellac, or varnish before the first paper is hung. If the wall is properly sealed, removing the old paper can be done in the same way as on any other wall.

If you're in doubt about your walls, make a test on an out-of-the-way spot and stop if you see any signs of raw or crumbly plaster. In this case, your best bet is to leave the paper on, patch it up, and paint over it to provide a sound base for future paper.

But if the wall is stacked with paper in poor condition and you're determined to get it off, work with both the soaking and steaming methods this way: Wet the entire wall with one or two brushings, then apply the steamer pan very quickly to send just enough vapor through the paper to soften the paste but not the wall skin.

Work cautiously and avoid hacking away at the wall. Use the steamer pan repeatedly for short periods, rather than in long bursts as in a regular application. Where small areas of paper just can't be taken off easily, use sandpaper to cut them down flush and smooth.

Patching old paper. Torn and damaged paper that is left on to serve as a base for a new covering must be put into sound condition. First check for loose spots, particularly along seams and moldings and at window and door casings. Before lifting the paper to apply paste, moisten it so it will be pliable and won't crack or tear. Stip new paste under the loosened flaps and smooth them down with a sponge.

Cut out any large greasy spots with a razor blade and replace them with patches of the same thickness (don't worry about color or pat(ern). Hold any oversize piece of paper over the area, cut through the patch and old paper at the same time, then dampen the old paper to lift off the bad spot. The patch paper should fit perfectly. Sand smooth any bulges or cracks to the level of the surrounding paper.

If the old paper has overlapped seams, the top half of the seam can be cut off flush by running a razor blade down the sides against a straightedge, Moisten the strip, and you can then peel it off without removing the lower layer. Where the wall is badly marred by cracks and patches, a covering of muslin can be cemented over it to provide a smooth foundation for new wallpaper.



# Store Adhesives Upside Down

STAND all glue and cement containers on their heads to prevent hardening at the applicator tip or screw top. Either prop them up as shown or tape a small ring to the squeeze end and hang them.

—Erik Miller, Sherman Oaks, Calif.



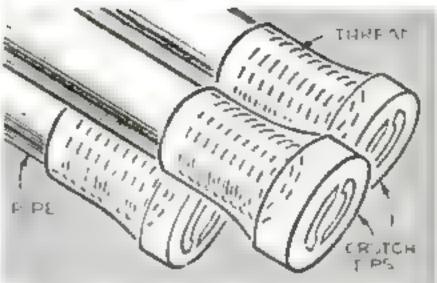
# **Ventilating a Doghouse**

A DOWNSPOUT elbow makes a weatherproof ventilator for a doghouse. Cut a hole in the rear gable just large enough to take one end. Once it's in place, calk around it.—G. E. Hendrickson, Argyle, Wis.

haust fan for our bathroom before I realized there was no room to run the usual metal ductwork, with its space-taking elbows. So I installed the flexible, wirebound fiber-glass duct that's used for venting clothes dryers. It came from a mail-order house complete with band fasteners, a hood for the exterior vent, and a built-in bonus: no vibration noise.

—Albert P. Grenier, McHenry, III.

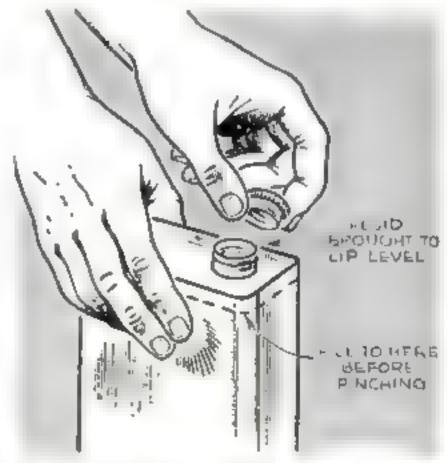




# **Protecting Pipe Threads**

Threads on loose pieces of pipe often become damaged in transit to the job because of rough handling. A plumber friend of mine protects the threaded ends by slipping a rubber crutch tip over them.

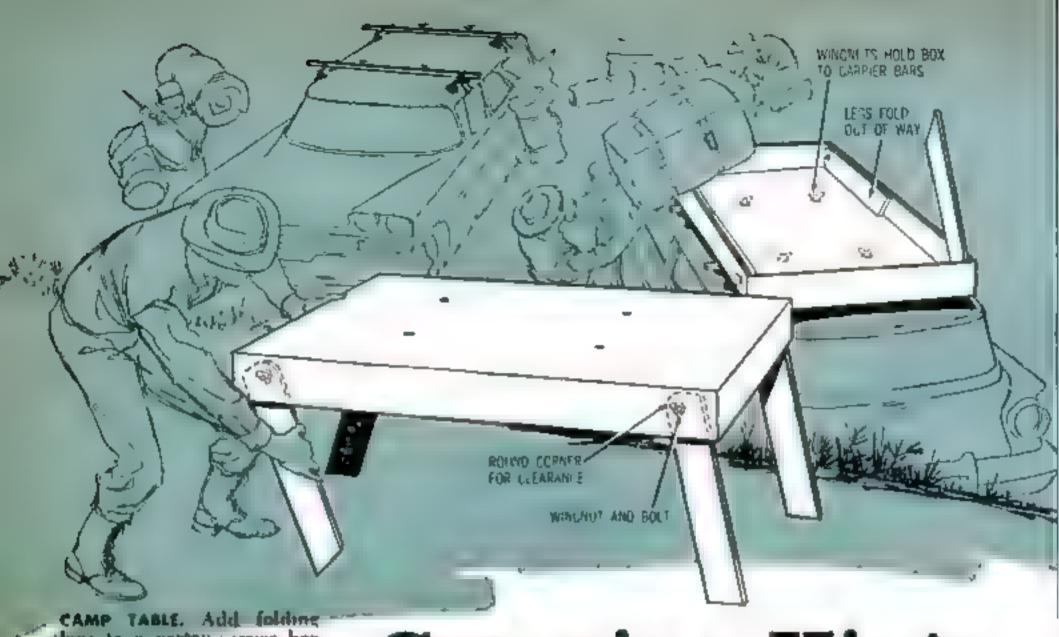
—William B. Engan, Maceo, Ky.



# **Tight Seal for a Can**

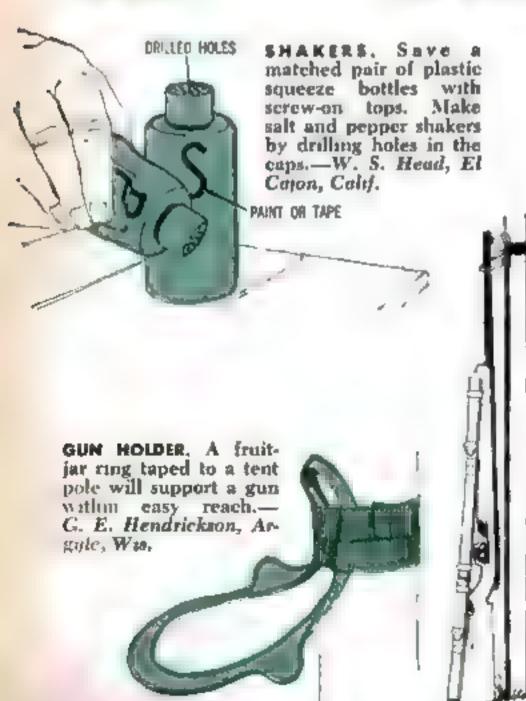
When you fill screw-top cans for storage of liquids, a tight seal can be obtained by leaving just enough space at the top so that when the sides of the can are punched the fluid level rises to the lip of the spout. Hold the level there while the cap is screwed tight, then release the finger pressure. In dropping back, the liquid creates a partial vacuum that prevents leakage if the can is tipped.

—Malcolm Goodwin, Wyandatte, Mich.



camp table. Add folding legs to a sartop-carrier box and you have a table. Pivot the legs off center so that, when open, they'll be braced against the floor and side of the box. Use wingnuts and bolts to replace the box on the carrier.—Paul J. Beeman, Clay, N. Y.

# Camping Hints from Here and There

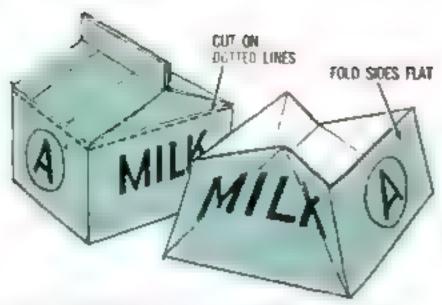




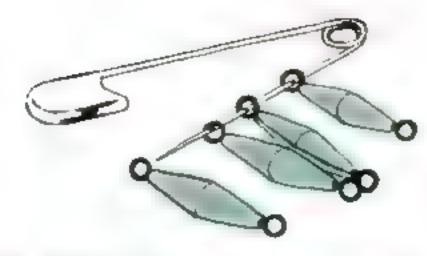
What can you do about a small hole in a tent when it rains? One camper put a big-headed thumbtack through the hole from the out side, pushed it into a cork inside.—Fred Cornelius, El Paso, Tex.

PRESH MICK. To keep an open can of milk fresh: Put it in a plastic bag, fold the mouth of the bag over several times and tie. Place the bag in a cold stream or lake with a large enough stone on top to keep it under the water.—John Krill, North Lima, Ohio.

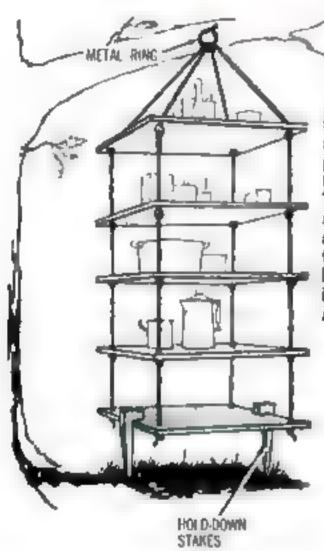




NEED A DRINKING CUPT A pint-size milk carton cut and folded as above makes one to fit a pocket.—Ron McGes, Jackson, Mich.

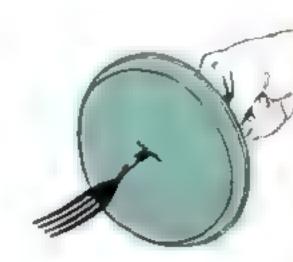


EXTRA SINKERS. Keep extra fishline sinkers handy this way—by stringing them on a large safety pin.—G. E. Hendrickson, Argyle, Wis.

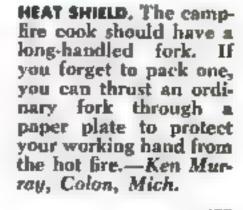


them to the woods with you as a few pieces of hardboard or plywood suspended on knots tied in four pieces of light rope. Tie the top ends of the rope to a metal ring, hang the ring on a nail driven into a tree. Two tent pegs driven into the ground keep the shelves from swinging in a breeze,—John Franklin, Franchmana Bay, Ont.

TAKE A CARPENTER'S APRON along and, when you set up camp, tie it to a tree. The pockets will hold spice boxes, cutlery, and other cooking items near the fire.—Mrs. Edwin Johnson, Iron Ricer, Mich.



Remove the liquid container from an old insect spray gun by breaking at the soldered joint. It will serve as an effective bellows for coaxing a reluctant camplire into flame.—James Haller, Erie, Pa.





# Lever Makes Job Easier

CLAMP-ON kitchen appliances such as meat grinders usually have only a wing-nut handle to turn the adjustment screw. A common clothespin, drilled at its open end and secured over the thumbpiece with a short bolt, makes adjustment easier.—G. E. Hendrickson, Argyle, II is.



# V-Rack for Files and Rasps

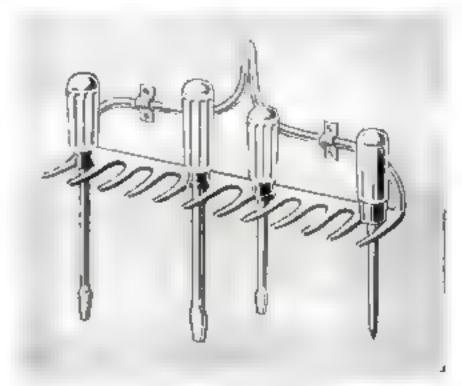
ALTHOUGH files are tough, jumbling them together in a workbench drawer will dull their edges. This wall rack protects them and permits quick selection of the right tool. The brackets are screwhooks of various lengths.—Erik Miller, Sherman Oaks, Calif.



# **Spotlight for Electric Drill**

For real convenience, add a spotlight to your power drill. Just tape a small penlight to the top of the drill, as above.

—John A. Comstock, Wellsboro, Pa.



### **Tool Rack from Old Rake**

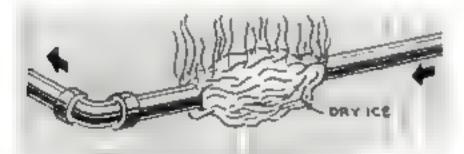
AN OLD garden rake, fastened to the wall with staples or brackets bent from 1/16" aluminum, makes a sturdy tool rack.—Dave Roberts, Devon, Pa.



### No Need for a Post Hole

CONCRETE blocks are used to support posts for a temporary electric fence on the Kearns Brothers farm in Randolph County, N. C.—Jack Dermid, Raleigh, N. C.

►►►FOR cook-outs, form two-pronged wiener-roasting sticks by rebending wire hangers. Burn off the finish on the times.



# Dry Ice as a Plumbing Aid

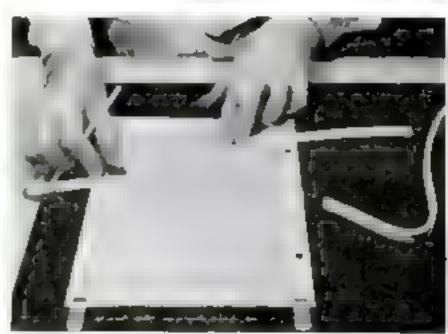
For even simple repair jobs I used to turn off my entire water system. That is—until I hit on a way of shutting off the water only where I wanted it off. Now I follow the pipe back to where it is exposed. I pack dry ice around it, holding it in place with aluminum wrap. This freezes the water. When the repair has been made, the pipe can be thawed out or allowed to thaw on its own. Caution: Wear gloves when you're handling dry ice.—Warren J. Mundis, Poplar Bluff, Mo.

### How to Save on Charcoal

When you finish broiling steak or hamburgers in a barbecue, smother the fire with an overturned pan. You'll prevent a mess, eliminate fire danger, and save unburned charcoal for use again.

—Robert A. Brown, Shelbyville, Tenn.



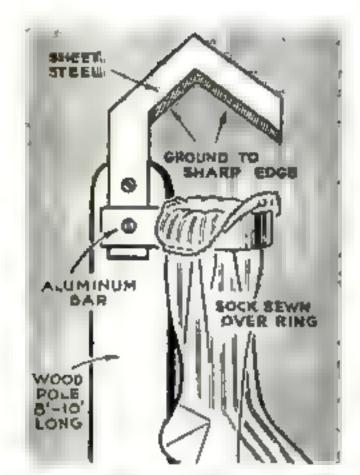


### A Guide for Curved Lines

When I had to make some rush drawings and found I had no adjustable curve, a couple of pieces of surface electrical cable filled the bill nicely. The cable bends easily and holds the shape well while you use a pencil or ruling pen to draw the curve. (The brand I used was Flamenol.)—W. E. Burton, Akron, Ohio.







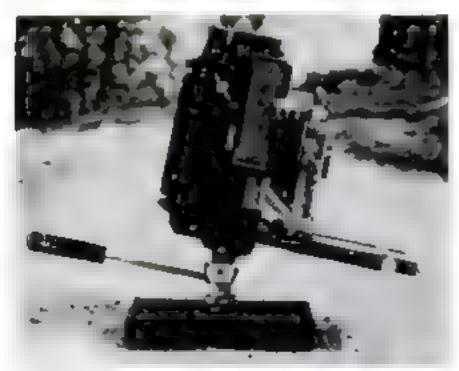


# Long-Reach Fruit Picker from a Sock on a Pole

You don't need a ladder to harvest apples, pears, oranges—or even the delicate avocado—if you make this simple pole picker. Attach the two metal parts with screws and insert a man's cotton

sock through the ring, folding the top down for stitching. Several pieces of ripe fruit can be dropped into the sock, without bruising, before you lower the pole.

—T. C. Garstone, Altadena, Calif.



# Support for Low-Angle Shots

The legs of many tripods don't spread enough to shoot close-ups of small objects on the ground, such as wild flowers. This unit, which sits on the ground, is made from a piece of iron 4" wide, 8" long, and 11/4" thick. I drilled and counterbored a hole through the center to take a 1/4"-20 stove bolt for screwing on a tripod head.—Jack Dermid, Raleigh, N. G.



### **Block Protects Floor Outlet**

Surface-mounted outlets on the base-board are vulnerable to furniture movement; plugs even more so. A wood block about 3/4" thick by 2" by 4", screwed to the floor underneath, will protect the outlet and plugged in fittings. The furniture leg can come no nearer the electrical parts than the outside edges of the block.

—Harry Walton, White Plains, N. Y.

# A PS EXTRA

# HOW I BUILT THE

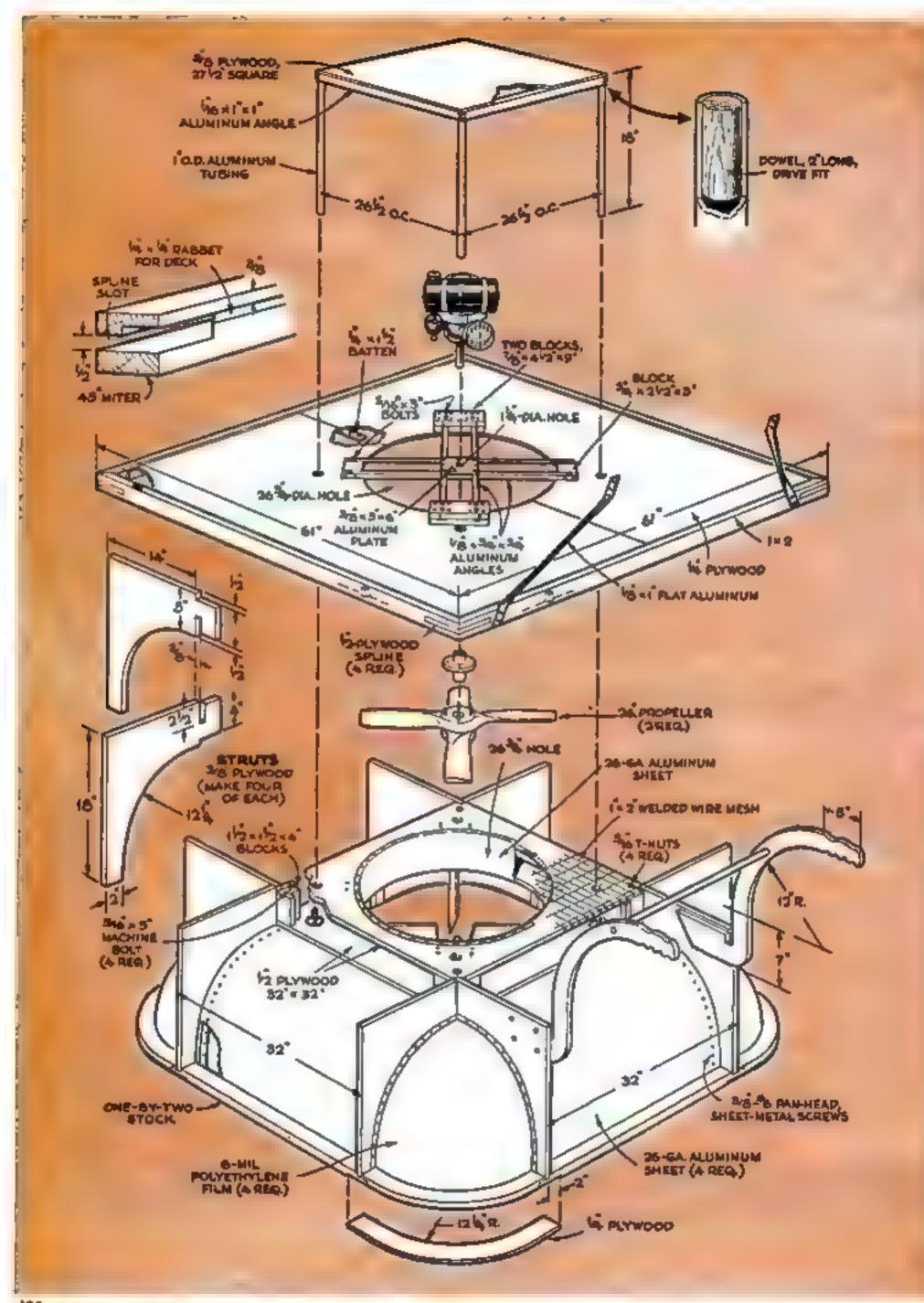
# Flying Cart

BACCIO PEAT

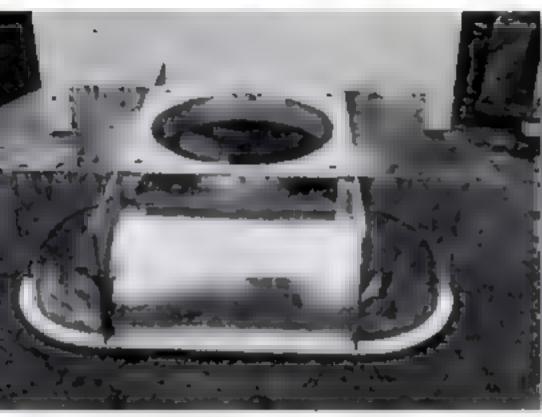
# By Hubert Luckett

A flying carpets when you open the throttle and see a 200 lb load field early off the ground. Tip the bandies alightly and you have to brace yourself to keep this wheel-less Flying Cart from skittering down the drive faster than you want

That's a 200-lb. load - four 50-lb. bags - entirely supported on a cushion of air.



# Plywood, plastic, and aluminum make the airframe





FINISHED "HULL" showing how fan shroud and rounded contours in the plenum chamber are obtained, using sawed-to-shape plywood covered with a skin of sheet aluminum and plastic film.

ALUMINUM IS PASTENED to inner curve of struts by bending a flange over flat against the plywood, and securing with stapling gun. Aluminum is slit every 1 1/2" to make a smooth bend.

to follow. More—you can easily trundle a 100-lb. load across a soft, soggy lawn with this machine and never leave a mark.

The Flying Cart is a true ground-effect machine (GEM) It has no wheels. It glides on a cushion of compressed air supplied by a modified chain-saw engine and a four-bladed wooden prop.

I built the "airframe" of ordinary lumberyard materials for \$59.75. If you're well supplied with plywood scraps you can cut that figure in half. Engine and props are from an outboard air-drive unit sold by Airboats, Inc. (3323 N. Florissant Ave., St. Louis 7). New, they cost \$130.

How it got that way. The cart didn't start out as a search for an improved wheelbarrow—it happened the other way around. The building itch came with the first story I read about air sleds, and intensified with each story thereafter. It was a challenge to build a totally new kind of vehicle before all the development problems were trampled to death—and all the unanswered questions were answered—by multimillion-dollar research programs.

I doodled the requirements. It would have to be:

 Reasonably easy to build with ordinary home-workshop tools.

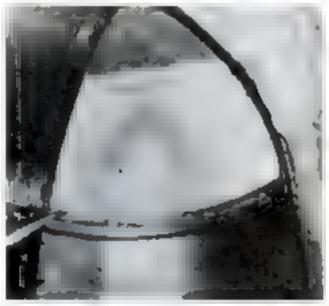
Adaptable to continuing changes and experi-

# Write for fuller drawings

Want to build the Flying Cart? The drawing at left shows enough for you to proceed on your own. For larger scale drawings, send \$1 to: FLYING CART, Popular Science, 355 Lexington Ave., New York 17, N. Y.



cross-Lapped struts are clamped between main frames, glued and screwed to the spacer block. Note floor flange that unchors leg of the platform covering engine.



PLASTIC FILM is folded double under the clamps. Sheet-metal screws hold the two aluminum clamping strips. Plywood clamp at bottom is held by wood screws.

# Add the deck, motor mount, and prop

beld by bolts securing the motor mount. Side rails are notched to engage upper corners of the struts and rabbeted to receive 4"-plywood deck cover. Wiremesh blade guard is clamped between deck and hull.



MOTOR MOUNT is bolted through the deck and upper main frame. Hardwood blocks clamping ends of each pair of angles add rigidity to the mounting assembly.



PROPELLER MUST BE BOLTED to the hub after the engine is in place. Vanes were added after the first trials to counteract torque effect and improve the air flow.



mental modifications, yet functional in its most elementary form.

 Large enough to carry a practical load—not a toy.

 Small enough for one man to handle and not pose an awkward storage problem.

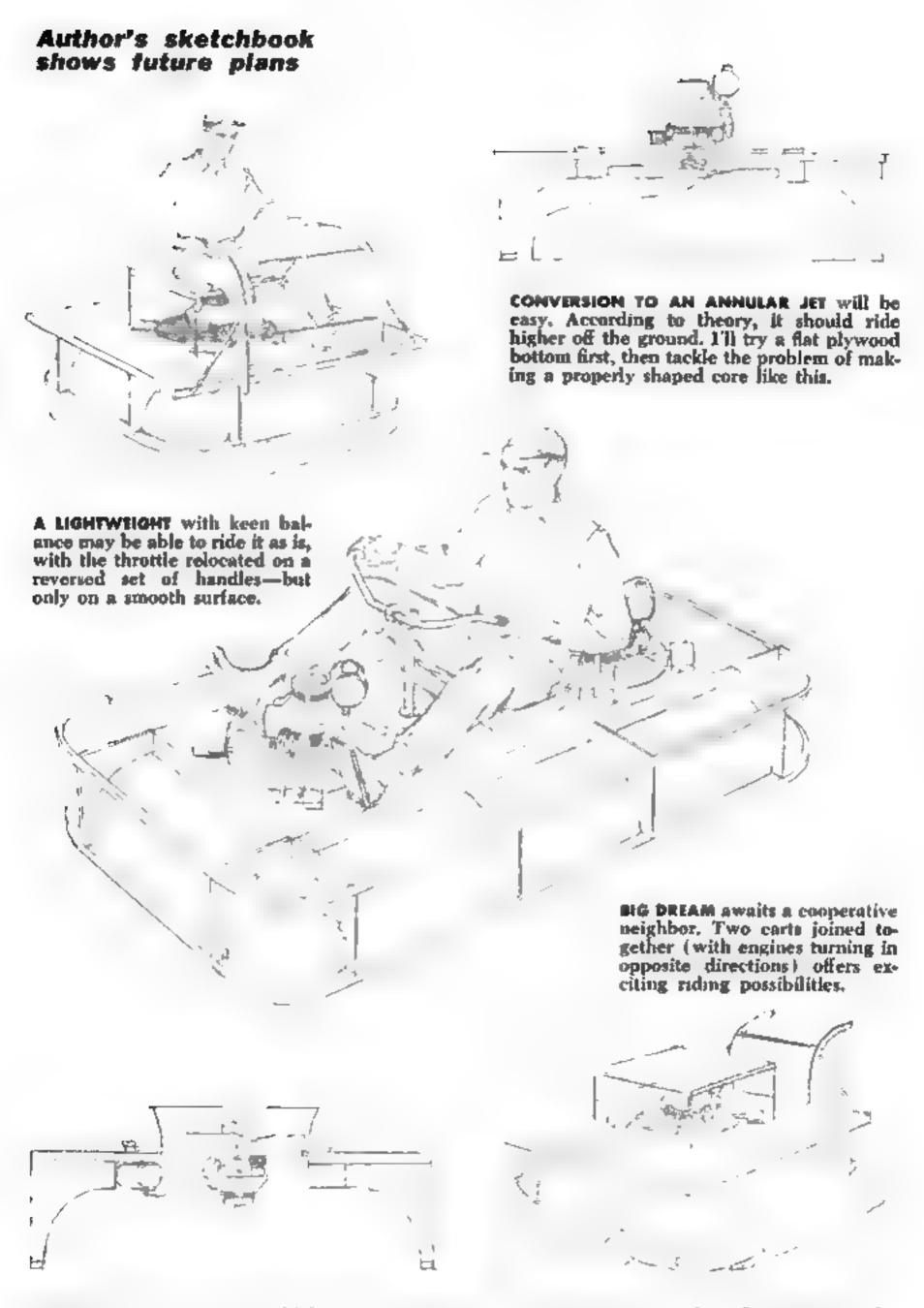
Cheap enough for a modest budget,

All of these points apparently ruled out a riding vehicle. So when someone suggested an air barrow, it seemed like a happy choice.

The one that didn't work. Take one leftover sheet of plywood that happened to be 34" by 48"; nail one-by-fours to the edge to form an open box; cut a hole 24½" in diameter in the center of the plywood sheet, and you have the body of my first "feasibility-study" model. A ½-hp. electric motor driving a 24", three-bladed cast-aluminum exhaust-fan prop supplied the air. I wanted to see if the crudest possible rig would provide any encouragement to go ahead with the project. It almost didn't. When I switched it on, the shop filled with a wild roar and a dense cloud of dust, but there were no signs of levitation. The air stream was hitting the floor and bouncing right back through the fan blades.

I extended the sides to 16" to get the fan farther from the floor. This time it teetered on the brink of floating. Backwash through the fan was greatly reduced. I rigged up a crude equal-arm balance and found that the machine required

[Continued on page 226]



INVERTING THE ENGINE would lower center of gravity and allow use of standard prop with an engine rotating in conventional direction.

AN OVERSIZE SKIRT with a drawstring in the bottom edge may improve stability and performance as an air barrow over rough terrain.

# Short Cuts and Tips

# Try a Barbecue in a Wheelbarrow

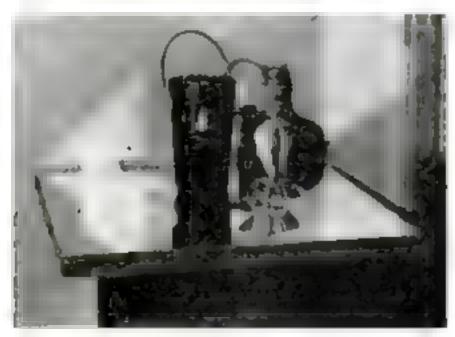
Put a metal wheelbarrow to work for cooking out-doors; you'll appreciate its mobility the first time rain sends you hustling for cover. A junk yard or appliance dealer can supply an old refrigerator shelf for a grill. Hold it in place with S hooks bent from heavy wire. If you're uneasy about damaging your barrow, you can build the fire on a layer of sand.—James Bartlett, St. Petersburg, Fla.





# Safety Mark on Saw Fence

With the area covered by the saw blade painted red, the zone of danger and the exact position of the blade will be known for blind cuts. Raise the blade to its highest position; trace the arc on the fence.—R. Hansoom, Elmhurst, Ill.



# **Guide for Driving Brads**

GETTING brads started is awkward and often rough on the fingers. I overcome this by sticking them through a folded strip of paper. It holds the brad in position until started. Then I just pull the paper out.—Bil Toman, Palatine, Ill.

# Glass Makes New Table Top

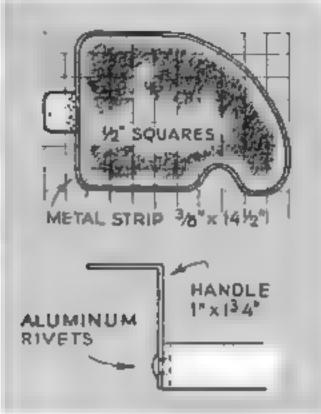
A SERVICEABLE new top for a small telephone or bedside table can be made from glass, including even discarded mirrors. Cut the glass to size. Lay it over a matching piece of 3/4" plywood. Then cover wood and glass edges with veneer strip. This inexpensive material has an attractive wood grain, and can be toned with stain and wax to match the table. Any good glue will give a tight bond, but a special cement is available.—Carlton G. Bucher, White Plans, N. Y.

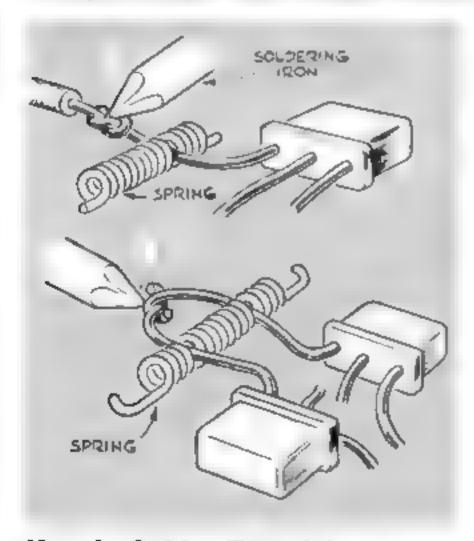


# **Mold for Hamburger Steaklets**

AT YOUR next party or outdoor barbecue, your hamburgers will make an even bigger hit if you serve them shaped like little T-bone steaks. Make the mold from 'a" aluminum, as at right, joining the ends of the strip by riveting them to the L-shaped handle.—Robert Micals, Freehold, N. J.

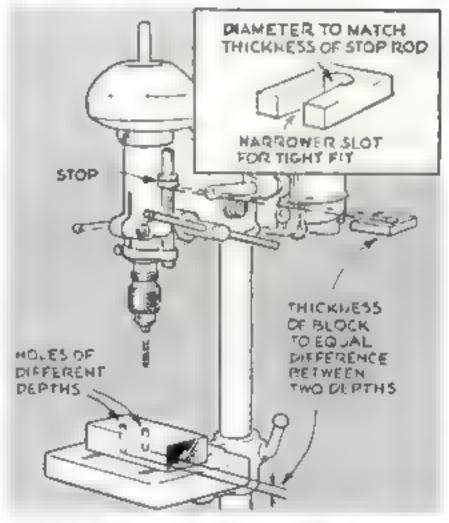






# **How to Solder Transistors**

THE problem when soldering transistors into a circuit is that heat may damage them. Pliers will serve as a heat sink, but they leave only one hand for the work. I clamp the lead in a small spring; thus the heat is dissipated by the coils before it can reach the transistor. The spring also functions as a miniature vise when you solder two transistors together—D. Van Gilder, Denver, Colo.



# Intermediate Stop for Drlll

Boring holes or mortising to two different depths in a series of pieces on the drill press usually involves tedious resetting of the stop gauge. Here's a tip: Set the gauge for the deeper drilling. Drill, Now beneath the stop slip a block the thickness of the difference between drill depths. With the shallower hole bored, remove block for the next piece.—

John F. Marshall, Newburyport, Mass.



# By Harry Walton

FELLOW showed up at a modelplane meet last fall with a strange, rubber-powered contraption. It had twin props at the rear, flew with elevator in front. Most of the onlookers had never seen such a thing—an old-time twin pusher. It stole the show.

The incident made me wonder. Why should we let those old flying machines be forgotten? They flew well half a cen-

tury ago-and would if built again.

Early modelers tried fancy gearboxes to wring all possible action out of their rubber-strand motors. But nothing beat a long fuselage carrying yards of elastic. So they whomped up some weird flying machines to achieve this.

Wings were straight; nobody had invented dihedral yet. Twin props could be used to eliminate torque, but balsa was unknown to modelers, who used spruce, pine, and bamboo. Models were

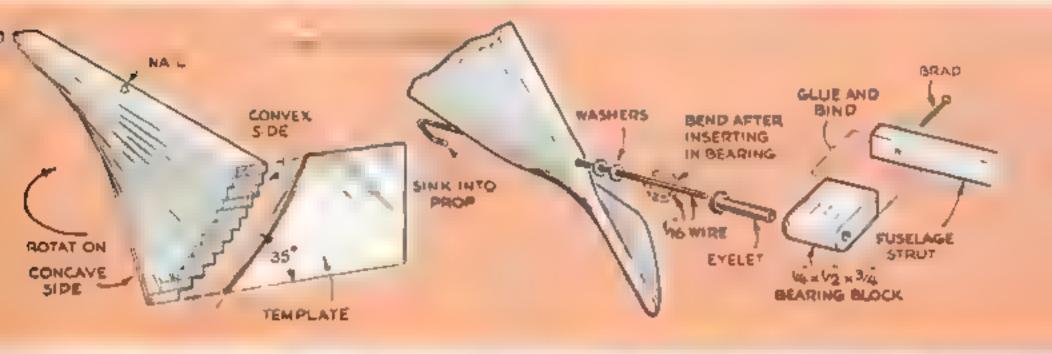






FOR THE PROPS, drill center holes in 5-16"-hy-0-5-8" strips of 1-16" hard balsa. Cont both sides of each piece with slow-drying glue. Stack them 1" high on a nail, twisting the stack to an angle of 35 degrees at the ends. Check with a template as shown, For the second prop, be

sure to stack the strips in the opposite direction, The bearing blocks are wood, bushed with evelets. Shaft books must be formed after shafts are in the bearings. Attach the bearing blocks to the fuselage sticks with glue, one brad each, and a binding of strong thread.



**BOIL RIB STOCK** and spring each piece, using a pg made of three mads, to the arrival shape shown in the drawing. He sure to assemble ribs square to the wing spar and all facing the same

way. Hold both main plane and elevator on the fuselage with rubber bands as below, sliding the planes into position. Set the front edge of the elevator on the tapered blocks.



heavy, had to be hand-launched, flew strictly on prop power, and landed fast—

but set some sizzling records.

One famous twin pusher designed by Cecil Peoli flew a record third of a mile at 22 m.p.h. way back in 1911, Though later pushers hit 40 and 50 m.p.h., Peoli's was such a good flying machine that it was still a popular model in the Twenties, That's when I built it from a kit,

Parts weren't precut in those days. I had to boil, bend, and even sew pieces together. Wound and straining to go, that gawky machine was an exciting handful. Let go, it streaked off at a terrific clip. Why not, I suggested to Roy Clough, an active modeler today, build that old champion again?

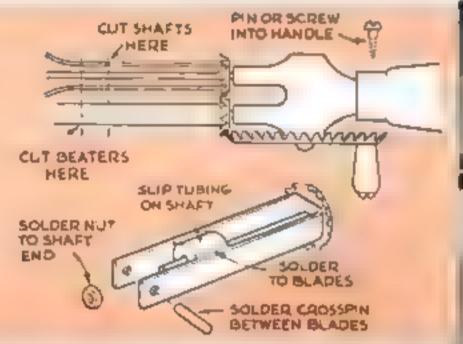
With plans borrowed from the manufacturer of the original kit, Clough went to work. The props were a problem, for they had to turn in opposite directions, by its bearing block to each motor stick, using glue, a single brad, and a seizing of strong thread.

Bevel the opposite face of the other end of each stick to join them at the pointed end of the fuselage. Shape the double-eyed motor yoke to fit over this end and bind it fast. Three 1/16"-by-1/8" bamboo cross braces complete the Ashaped fuselage.

Split bamboo off a pole that will yield the desired thickness after the pithy inner layer is scraped off. For paired parts such as the rear skids, split off doublewidth pieces. Make the bends and split

the bent parts in half.

Hold the bamboo near a candle or alcohol-lamp flame, the shiny side away from it. As the fibers soften, bend the piece inward toward the pith side. Hold in shape until it cools. (Very dry bamboo may bend more readily if moistened.)





CONVERT AN EGG BEAFER to make a double winder like this. Pin or screw the handle on its ferrule to sustain the pull. With props turning

inward at the top, either turn the handle of this outside-gear winder backward, or hold plane upside down, turning the handle forward.

and we couldn't buy right- and left-hand ones of the right size. Clough solved that by gluing them up of strips—with no hand carving.

Make yours by stacking 5/16"-wide balsa strips, staggered at a 35-degree angle. Stagger the second prop at the opposite angle. After the glue has set hard, sand the steps away, shaping one side slightly concave, the other convex.

Mount the shafts in these props with the motor hook on the convex side. The original props turned inward at the top, but either way will do as long as you wind them accordingly. Fasten one prop The single front strut has two braces, one to each fuselage stick. Mount the rear skids and their braces at equal outward angles, with the cross brace in the crotches.

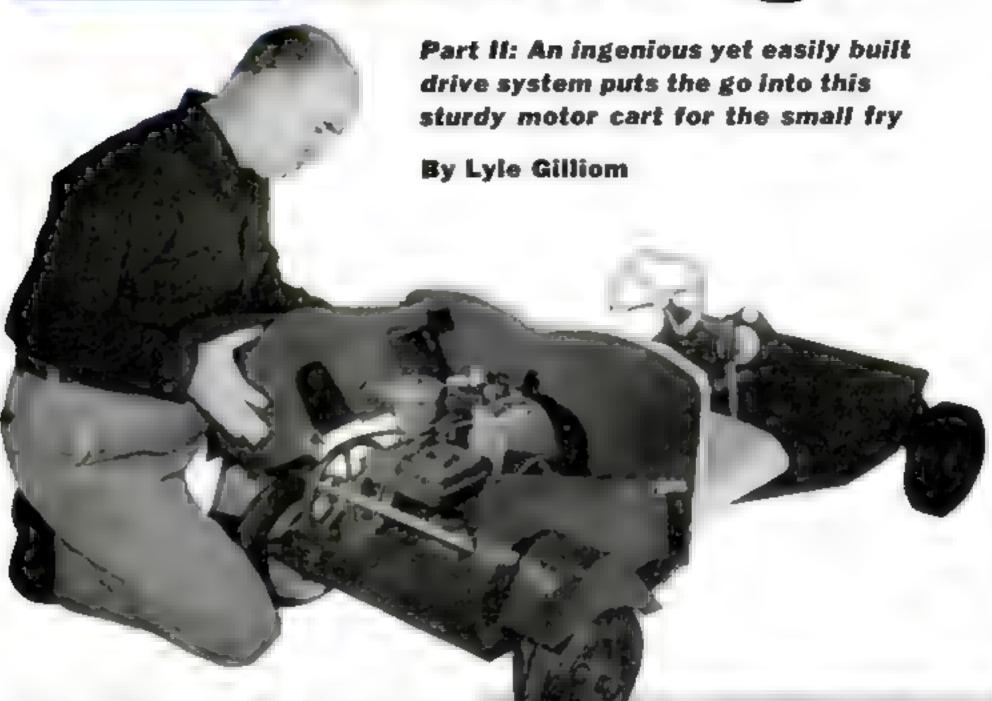
Wing ribs. Cut them 4" long from 1/16"-by-1/8" spruce. Boil half an hour and clip them into nail jigs. Let dry overnight. For the short ribs of the main plane, trim long ones at both ends.

Shape the ends of the ½" spars to a point at the ends. Drill (or burn with a hot nail) a tiny hole ½" from each end of every rib and spar.

[Continued on page 221]



# How to Power the PS Kinderwagen



HAT makes the POPULAR SCI-ENCE Kinderwagen ideal for youngsters is its one-lever control, Pushed forward, it latches into drive position; the cart takes off smoothly and keeps going. Pulled back, the control lowers the reverse-spinning friction

drums, braking both wheels.

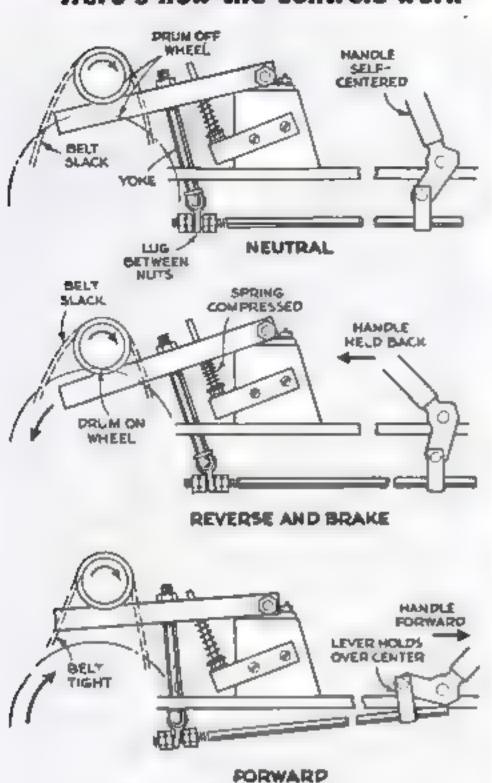
To back up, the same lever is pulled back and held. The drums move the car amouthly in reverse, but at low speed and only so long as the control lever is held. When released, it returns to neutral.

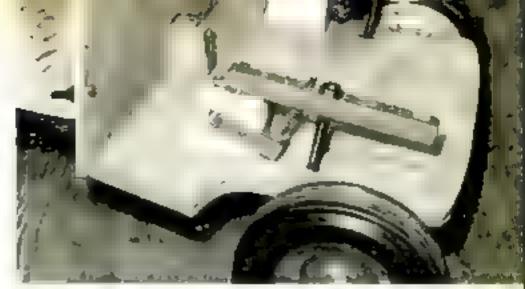
Tricky and ingenious? Yes, Hard to build? Not at all. The power trainstandard shafting and pulleys—is made by sawing, drilling, and filing. The drive is by V belts.

You are ready to undertake this part of the job after winding up the construc-

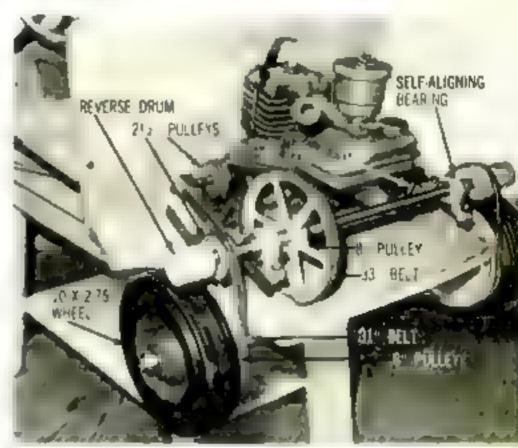
LEFT-HAND DRIVE puts the control lever on right side of the chassis beam, the control shaft running through the beam and bolted to the floorboard at each end. Throttle is fastened to beam; its cable runs under the seat.

# Here's how the controls work

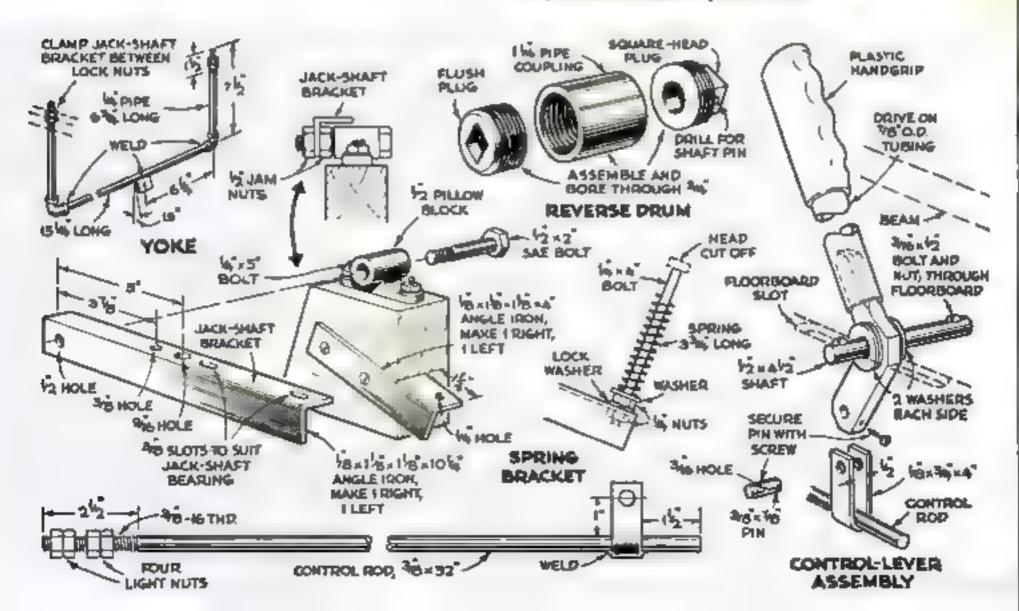


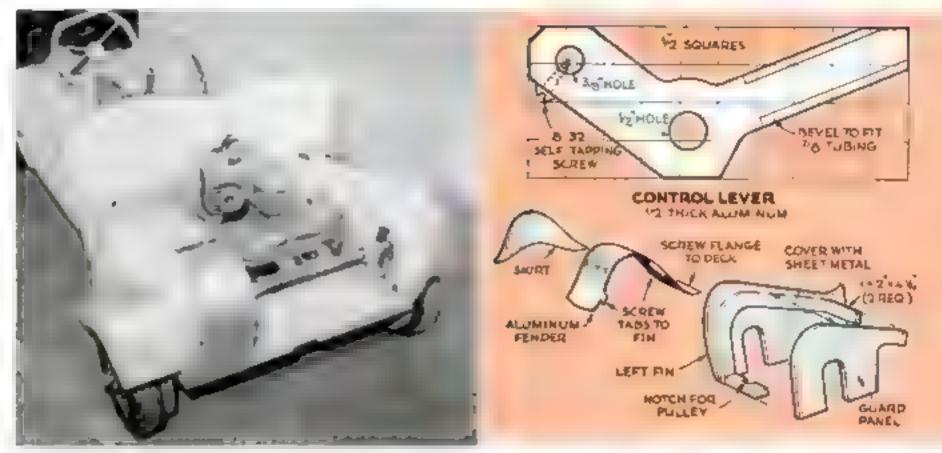


JACKSHAFT BRACKETS pivot in pillow blocks and are held up by springs to keep the reverse pulleys off the tires. The yoke should be fastened rigidly to the brackets with double nuts.



POWER DECK, with a typical four-cycle engine in place, looks like this before the fins are mounted. These go outside the jackshaft brackets. Note alignment of the engine shaft with the jackshaft-bracket pivot bolts.





MOUNT TAIL FINS with corner brackets to the seat back and engine deck. Make a plywood cage for the jackshaft pulley, covering it with

tion of the body as described last month.

Drive pulleys for the rear wheels should be the hubless kind with a big center hole. Lay out four 1/4" holes 90 degrees apart on the flat area of the wheel web. Center a pulley as accurately as you can on the wheel, clamp it so, and drill through the web holes into the pulley. Be sure to mark each wheel and pulley so that you can assemble them in the same position as when drilled.

Saw short spacers from \( \frac{1}{4}\)" pipe to a length that will hold the pulley rim \( \frac{1}{4}\)" away from the tire. Assemble with \( \frac{1}{4}\)"-by-2\( \frac{1}{2}\)" machine bolts, lock washers, and nuts pulled up finger-tight. Then mount a wheel on the axle (or similar stock held in the vise) and spin it to determine where the pulley runs out of true. Tap the pulley on that side, continue testing, and when it runs dead true tighten the nuts hard. Mount both rear wheels with shaft collars.

Jackshaft mechanism. Being belted to the engine, the jackshaft must pivot on the center line of the engine shaft in order to maintain pulley spacing and so keep drive-belt tension uniform as it swings. Check the height of your engine shaft, and if necessary make the wooden spring blocks higher or lower.

Mount the angle-iron jackshaft brackets on ½" S.A.E. machine bolts with nuts on both sides. The smooth bolt shanks pivot in rigid pillow blocks. Mount the spring brackets with wood screws and sheet metal (see also photo on first page of story). Use small wood screws to join the fenders to the fins and the skirts to the fenders.

set the springs on long headless bolts.

The control yoke is bent from ½" shafting and threaded at each end, or built up of ¼" pipe and elbows with the horizontal joints pinned or welded. Weld the control lug on at a 15-degree angle. Fasten the yoke to both jackshaft brackets by tightening nuts above and below.

Place the engine on the deck to locate the jackshaft blocks and to check for free



START UPHOLSTERING by sewing 3%" hems in 13%"-wide strips of fabric-backed artificial leather. With the finished side down, tack the strips through the unhemmed part to the seat edge (hem down) and back edge (hem at rear). Cut covering 2" oversize. Tack both covers along bottom back line with cardboard strips as above.

yoke action. Mount the blocks with 1/4"-by-5" bolts through the pillow blocks.

Jackshaft bearings must be the selfaligning type to prevent binding. They are adjustable in slots in the brackets to permit tightening of the belt. Be sure to put the 8" pulley and a 33" V belt on the shaft as you slide it into the bearings.

A shaft collar, a 2½" pulley, and a reverse drum go outside each bearing. Before tightening any setscrews, file a flat in the shaft under each to avoid burring. Use hollow-head setscrews.

Reverse drums can be simple 2" flatbelt pulleys, or may be built up with some machining. The shaft hole must be true, but this is an easy lathe job. Use cast-iron or pressed-steel V pulleys. Fit 31" V belts from jackshaft to wheels.

Belt guards are a must where children are concerned. Make them of plywood and sheet aluminum. The inner one is a cage mounted on a tail fin. Deep fenders enclose jackshaft drums and pulleys.

Control linkage. Cut the control lever accurately to shape for proper latching action. File the long leg to a drive fit for a handle of aluminum or steel tubing. Push a bike handgrip on the top.

Thread the %" control rod at one end. Shape flat bar around %" rod to form the U bracket; then saw the legs to equal

### Full-Size Plans

... for building the Kinderwagen are available. Send \$2 to:
Gilliom Power Tools,
1109 N. Second St.,
St. Charles, Mo.

length and drill for the cross-pin. Have the bracket welded to the control rod, or attach it with bolts.

The lever pivots on a short shaft bolted directly to the floorboard. With the lever latched over in forward position, adjust the nuts against the yoke lug to tension the wheel belts. Lock the nuts a trifle apart to let the control lug move freely to reverse position when the lever is held back. Over-center toggle action should keep the lever engaged in forward.

Engine mounting. Use any four-cycle, horizontal-shaft lengine of  $1\frac{1}{2}$  hp. or more. Fasten it with  $\frac{1}{16}$ " bolts through both engine deck and frame panel. A  $2\frac{1}{2}$ " motor pulley is recommended; a  $2\frac{3}{4}$ " or 3" one will give slightly higher speed.

For small children, the throttle cable is best booked to the engine governor rather than the carburetor throttle.



cut 1" FOAM RUBBER to same shape as the wooden seat and back, but make the slab for the back %" short. Then bevel the edges of both pieces where they meet, as above. Fold back the covering from the edge at which it's tacked to cement the rubber to wooden seat and back surfaces. Use foam-rubber cement.

Fold in excess fabric so you can tack the covering around the seat and back edges inside the hem line of the strips. Finally, fold these hems over the seat covering and fasten them with decorative upholstery tacks. Space the tacks uniformly for a neat appearance.



POCKET FOR SMALL SUPPLIES is assembled as separate unit and fastened to front of cart.



FRONT IS FASTENED to edges of shelves and bottom. A miter clamp assures square corners,

# Garden-Tool Caddy

HIS wheeled caddy keeps a full selection of garden equipment at your fingertips as you work around the yard. At the end of the day, it's easy to roll the cart back indoors for storage of your tools and supplies.

Tools are held in separate sockets to keep them neatly arranged. Any empty sockets automatically show up missing tools so you can't forget them. The pockets at the front hold small items.

The cart is made entirely of ½" plywood except for the two strips across the front of the pockets, which need be only ¼" thick. All ½" parts can be cut from a single sheet of plywood. The panels merely butt together and are joined with

LATCH BOLTS lock the handle up against stop blocks, allow it to be lowered for storage.

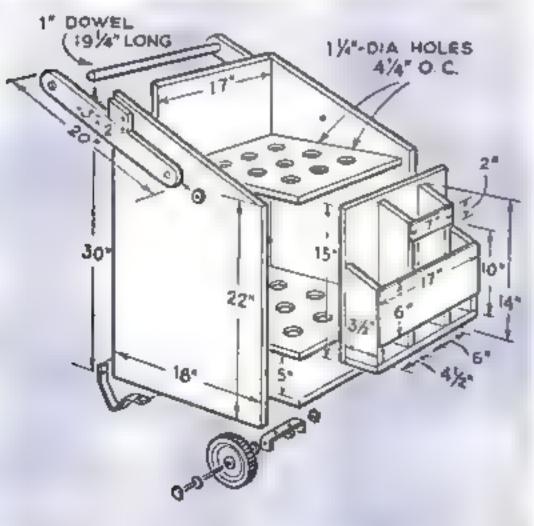
glue and 11/4" No. 8 flathead acrews.

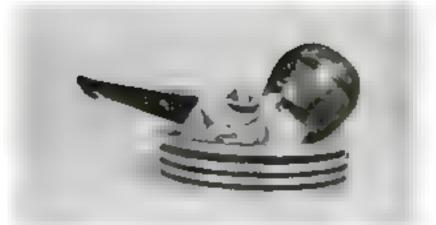
The sides should be laid out first because the angle at which they are cut at the top determines the degree of bevel for the upper edges of the front and back panels and the slant of the pocket. The cart's bottom and the two spacers that form the tool sockets are all 17" square. Clamp two of them together so you can drill the 11/4" socket holes through both at the same time. The two spacers and the bottom panel are then fastened to the back panel, and the front and sides are put on last.

Buy a pair of ball-bearing wheels at least 6" in diameter for easy handling on uneven ground. The wheels are held by U-shaped brackets bent from 6" lengths of ¾" steel strap with long ¼" bolts run through them for axles. The brackets are easy to make if you drill ¼" holes at the ends of the 6" strips before bending them into a U shape. The back legs are bent from ¾" aluminum bar. Attach the back end of each leg, then adjust the height of the legs to level the cart before fastening the forward ends.

The handle pivots on \(\frac{1}{4}\)"-by-1\(\frac{1}{2}\)" carriage bolts and is locked in its raised position by sliding a latch bolt under each side. When storing the cart, the handle can be dropped to save space. For a durable finish, apply a sealer and several coats of good exterior enamel.—Oscar Parsons, Hialeah, Fla.

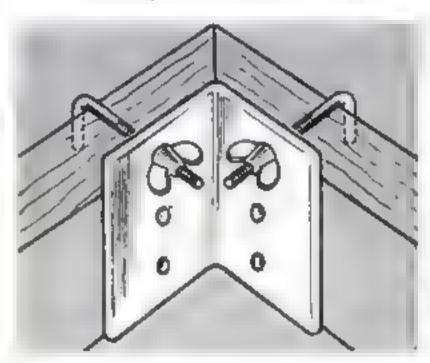






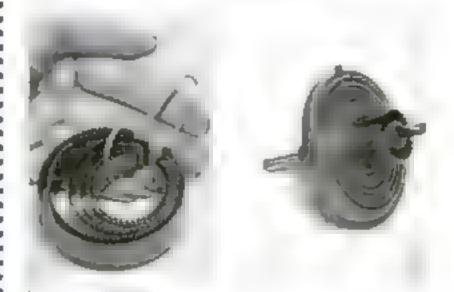
# **Novel Ash Trays from Pistons**

OLD pistons make rugged, sportylooking ash trays. Hacksaw through the wrist-pin bushings to form U-shaped holders and polish the metal bright. —W. Ellerington, Barrhead, Alberta.



# Clamps Made from Angle Iron

You can hold mitered frames together for gluing or nailing with clamps improvised from angle irons. Drill the angles as shown to take Lshaped hooks threaded for wingnuts. —M. Robert Beasley, Detroit.



# Ring Keeps Blades Safe

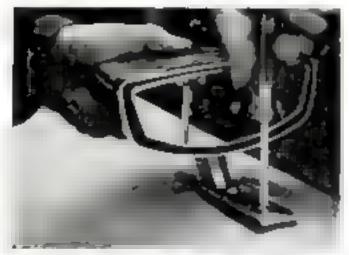
To keep a set of hole-saw blades from getting lost, string them on a shower-curtain ring or wire. This also lets you hang them on a tool board.

—John A. Comstock, Wellsboro, Pa.

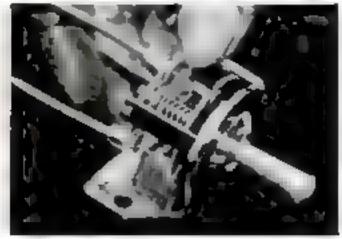
# How I Installed a RemoteControl Car Mirror



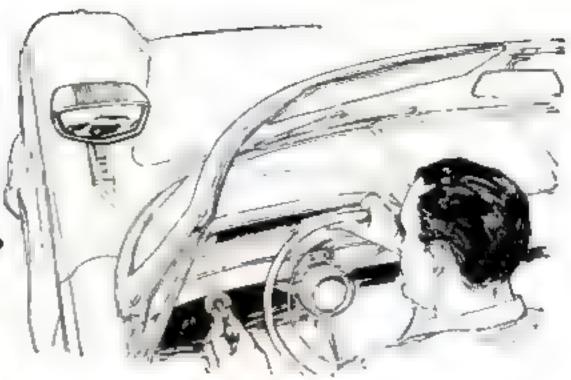
hole drilled in fender. Two 1/4" mounting holes also are needed.



MOUNT THE MIRROR with self-tapping screws. A gasket goes under the base of the mirror.



HOOK CABLE ENDS to control-lever assembly this way. Assembly goes behind instrument panel.



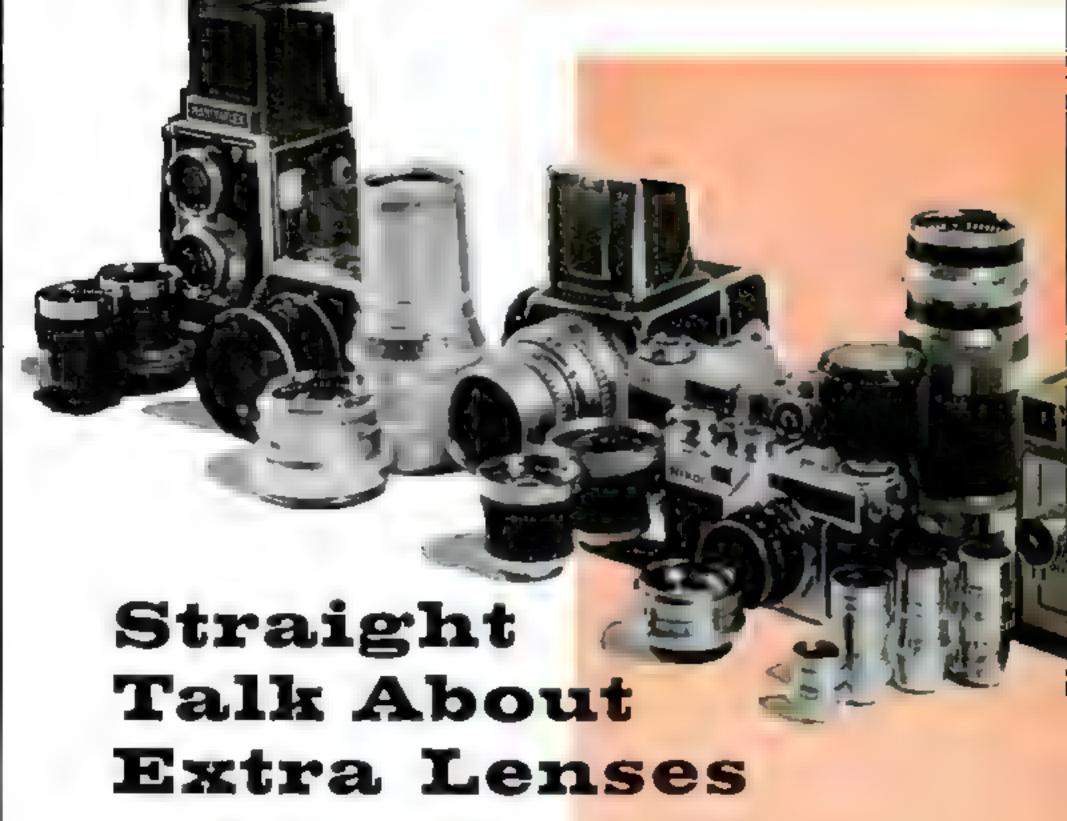
REMEMBER the last time a passer-by brushed against your side-view mirror and knocked it out of line? You had to climb out of the car, readjust the mirror, climb back in, and check the angle. Chances are it took several trips before the mirror was back in position.

Far easier to flick a dashboard lever that enables you to change mirror angle without leaving the car. Now, thanks to the mirror kits on the market, such an installation is simple.

The unit shown here, sold by the Roberk Co., Norwalk, Conn., for about \$13, consists of a futuristically styled mirror, three cables, a dashmounted control housing, and necessary hardware. The mirror frame remains stationary; a push or pull on the dash lever translates the same motion to the glass itself via the cables. The glass tilts upward, downward, or from side to side.

First select the proper location for the mirror. Check the fender underside to make certain the cables can pass through without interference. Also be sure that the mirror clears the hood. Next, using the mirror-base gasket as a template, mark the holes to be drilled. Centerpunch the marks with a nail or other sharp object, and drill two ½" holes and one ¾" hole.

Feed the control cables through the 3/8" hole, and then secure the mirror to the fender with two self-tapping screws provided in the kit. Most cars have extra holes in their firewalls; if yours does not, drill a 3/8" hole. Pass the cables through into the passenger compartment and slip the brass bushings at the ends of the cables into the appropriate terminals on the control-lever assembly. Drill two 1/8"holes in the underside of the dashboard to the left of the steering wheel and mount the control assembly with two self-tapping screws. Mirror angle can now be controlled by moving the dash lever in the corresponding direction.—Alex Markovich.



Tempted by a telephoto or wide-angle lens? Here's what they can do for your pictures

# By Phil McCafferty

LEAMING in photo-dealers' display windows these days is a seductive array of extra lenses. Probably you have eyed these fairly expensive pieces of glass, wondering just what they would do for your pictures.

Ask a pro and he'll tell you of the great flexibility they offer. Every serious amateur should weigh their possibilities. Still, they aren't miracle-workers. There's precious little that extra lenses can do that can't be done with a "normal" (standard) lens by changing camera position, Consider these basic facts:

A wide-angle lens increases the angular size of the scene the film sees. In doing this, it records every part of the scene smaller than a normal lens would.

A long-focus lens decreases the angu-

### Lens Terms Defined

Aberration: Effect produced by failure of a lens to bring light rays from an object into sharp focus. A "soft" image results.

Depth of field: Distance from farthest to nearest objects apparently in sharp focus.

Distortion: Any departure in the image from a true two-dimensional representation of a three-dimensional scene.

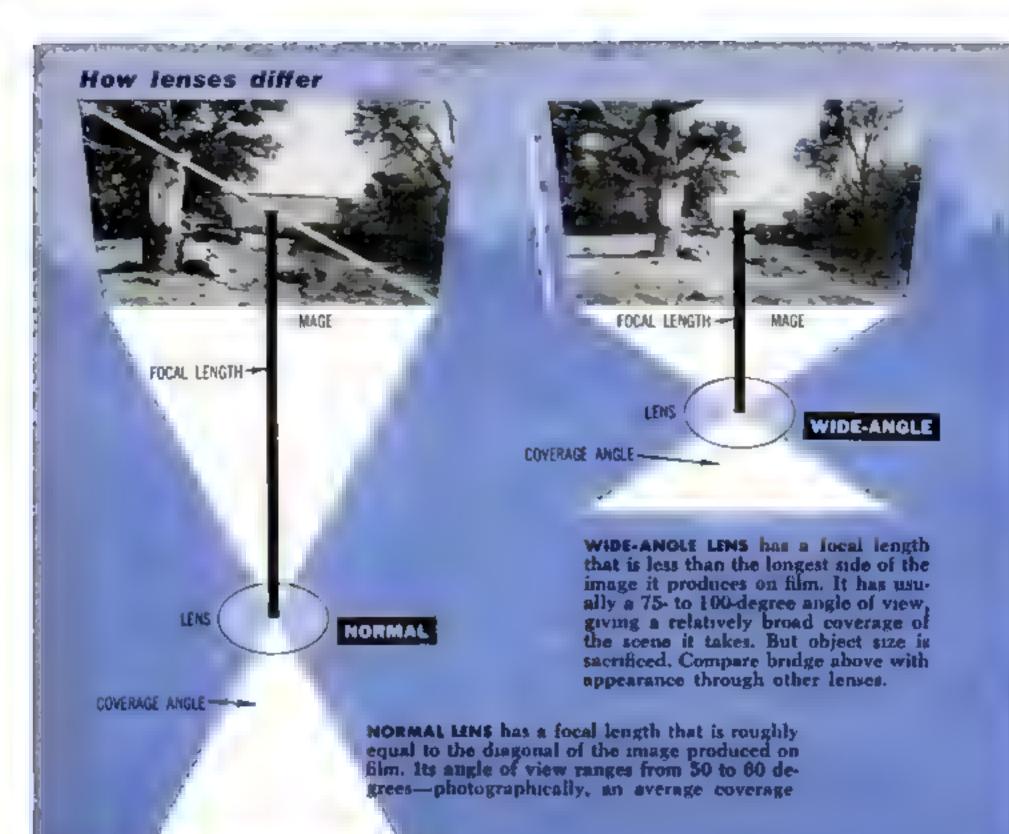
Focal length: For practical purposes, the distance from lens to film when the lens is focused at infinity. At a given distance from an object the longer the focal length of a lens, the larger the image on the film.

Long-focus lens: A lens with focal length greater than the diagonal of the film on which it projects its image. In common reference, often bunched with telephotos

Telephoto lens: A special type of longfocus lens designed for compactness—i.e., to produce the same large-image effect in shorter lens-to-film distance. It's smaller, easier to handle, usually costs more.

Vignetting: Underexposure of film in the corner areas. Caused by failure of a lens to transmit light equally over entire area.

Lens coating: A chemical coating on lens surfaces to prevent internal reflections that would detract from image sharpness.



Which Lenses	Do What Jobs
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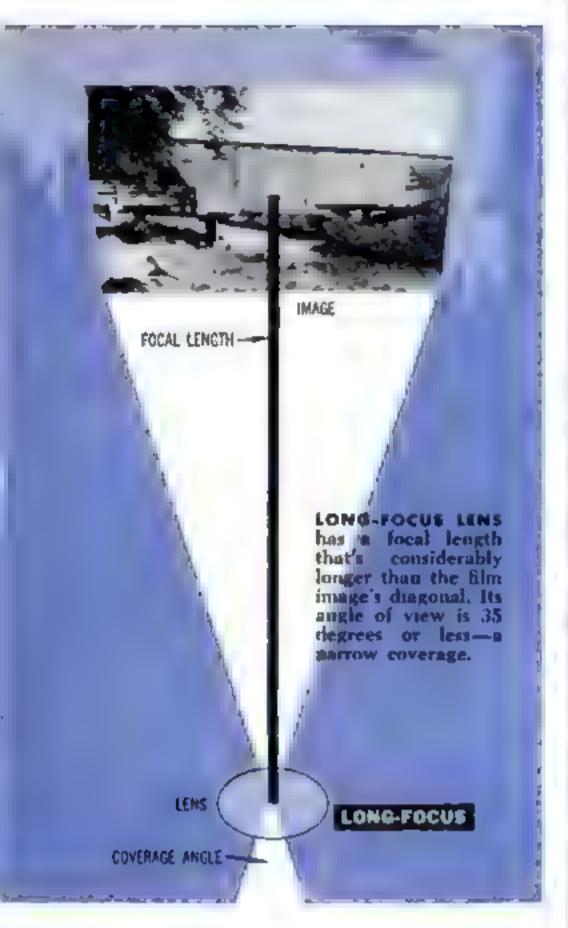
FILM SIZE	FOCAL LENGTH		
	NORMAL	WIDE-	LONG- FOCUS
8-mm movie	12 5-13 mm.	5 5-10 mm	24 mm, and longer
16-mm, movie and still	25-26 mm.	10-17 mm.	50 mm. and longer
35-mm. still	44-55 mm.	21 35 mm	80 mm. and longer
2¼" by 2¼"	75-80 mm.	38-60 mm,	105 mm. and longer
2¼" by 3¼"	101 105 mm.	47-65 mm.	135 mm and longer
4" by 5"	135-165 mm.	65-90 mm.	180 mm. and longer

lar area of the scene that the film sees, and records what it does see larger.

In practice, of course, it is often impossible or undesirable to move in or back with a normal lens to get extra-lens effects. Backing up to get a wide-angle rendering might put you out a window. Closing in to get a telephoto effect may spoil a candid shot. Trying to get a telephoto effect during enlarging can bring grain trouble, particularly with small negatives. And in the case of slides and movies, you're entirely stuck with what a normal lens records.

What wide angle offers. Here are some specific effects. When you switch to a wide-angle lens without changing camera position, you:

1. Increase coverage but decrease size of images; and . . .



 Keep more of the scene in focus.
 (If you decrease image size, you add to the depth of field.)

When you switch to a wide-angle lens and also move in closer, you:

 Eliminate distracting foregrounds, and . . .

2. Make near objects seem larger in respect to far objects. For example, a car will seem longer and lower; an icecream cone in a kid's extended hand will seem as big as he thinks it is.

You'll also find a wide-angle lens fine for scenic shots where a feeling of vast-ness is desired—in addition to the regular use in interiors and when you can't move back.

Switching to a long-focus lens, and retaining camera position, you:

1. Increase the size of objects at the



# What different lenses see

shooting the same scene from the same position, but with different lenses, produced these three prints. Notice that although the coverage and subject size vary, the perspective does not. Perspective depends on the camera's position, not on the focal length of the lens.





Only a special lens can take some pictures

SHOOTING AN INTERIOR with a normal lens is tough: There's seldom enough space so you can step back to catch a sizable area. A wide-angle lens, with its extra coverage, makes the job easy. But keep the camera dead level or vertical lines in the picture will converge sharply.

# Tips for Wise Buying of Lenses

What to buy: Avoid the extremely highspeed lenses unless you have real need for their slightly greater light-gathering abuity. Using the newer (ast films accomplishes the same thing less expensively Slower lenses cost much less, often give better definition at all openings. Best, too, to steer clear of the extreme wide-angle and longfocus lenses. Moderate focal lengths may prove generally more useful.

What's in a name? "Name" lenses often bring a premium price and may serve your purpose no better than a less expensive one.

Try-out: Even apparently identical lenses vary in quality. Most dealers will sell you a lens on a one- or two-week trial basis.

Testing: For a wide-angle, photograph a double-sheet of your newspaper's classified section pinned to the wall. Make a print Type should be legible at all corners. For a long-focus, shoot an object with detail (ironwork, brick wall) some distance away. Look for softening of lines in picture.

Attachment lenses: Some lenses fit over your regular one to produce telephoto or wide-angle effects. Usually less satisfac-tory than the real thing, but for not-toodemanding use, acceptable. Inexpensive.

film plane, at the cost of coverage, and . . .

Reduce the proportion of the scene that is in dead-sharp focus.

Moving back with long-focus (or tele-

photo) lens will:

 Allow you to duplicate coverage of a normal lens but include objects that might have been behind the camera with

a normal lens, and . . .

2. Compress depth, making far and farther objects seem close together. In a shot of rush-hour traffic, the cars will seem packed like sardines; or the kids will seem dangerously close to the beasts in the zoo.

You'll use a long-focus lens most often for sport and wildlife shots, some scenics, and whenever you can't move up. It has an extra dividend: Portraits often have less distortion through a long-focus than

through a normal lens.

Flexibility, then, is the great virtue of extra lenses. Even if they are not wonder workers, even if you'll still want to move up or back, they'll help your pictures. A range of focal lengths at your disposal can make each few movie frames, each slide, or each print stand out in individual meaning.

YOUR GUIDE TO TIRE FACTS FROM



Tires can and DO affect the way your car performs on the road . . . the way it steers, the way it stops, the way it rides . . . the feeling of safety it affords.

in the following pages you'll learn a lot of valuable things about tires. Just to mention a few: facts about tire buying,

tire maintenance,

how to get the most mileage out of your tires.

TIRES NEED CARE - True - all tires are better made today . . . safer, stronger, more dependable over the miles. True - the new tubeless tires, with which most new cars come equipped, have lessened the possibility of sudden, violent blowouts to a fractional minimum. But don't get the notion that tires have now reached a state where they can practically take care of themselves . . .

NO TIRE IS BLOWOUT-PROOF . . . your tires will serve you long and well only if YOU see to it that they do!

So read these pages carefully and you'll be that much wiser about the tires you should have and the care they should get . . . information essential to everyone who owns and/or 4 operates a car.

# BUYING TIRES

# how to get your money's worth

Know tire "grades" - As a guide to tire quality, you can generally go by tire-line designations: premium, first, second, and third, These grades, or classifications, differentiated by price, technically should relate to treadmileage wear. For example, you could expect to get only about half as many tread-miles out of a third-line tire as you would a first-line or premium tire. Manufacturers classify their various grades of tires by giving each one a different name. While line designations of different brands don't relate to each other, model names within a brand should indicate relative grades of tires. Se sure your dealer makes these classifications clear to you while you're considering which tires to buy.

The tires chosen to be original equipment on new American cars are classified by their manufacturers as "first-line" or "100-level." Remember that tires offered as "the same as original equipment" should actually be the same grade — like first-line tires made with TYREX tire cord, used on every American make of new car since the 1959 models.

When To Buy New Tires - Squeezing those last few miles out of tires that are worn and

scarred isn't wise for a number of reasons. You're playing with danger, for one. And you're actually losing money, for another. Tires with some life left can usually earn you a helpful trade-in allowance at your dealer's.

Consider the conditions under which you normally drive. While most of us cover a variety of roads in the course of a year, much of our driving is done in a fairly fixed pattern. Many drive chiefly on city or suburban roads that call for a good all-around tire. Others, such as salesmen, spend a good deal of time on long, fast turnpikes and thruways demanding tires that run cool and give above-average safety and mileage. Your tire dealer can be of great assistance to you here. Let him know what your tires have to face and he'll be better able to recommend the best tires for your needs.

A Pays To Shop Around—As with any product, tires in the same range of quality have their price differences, too. When shopping ask about tread-mileage, safety features, allaround dependability. Examine guarantees carefully. You'll find the best tire buys by looking for them.





The backbone of a tire is the cord used to make . Therein lies a tire's basic safety and strength.

The first step in making a tire is to weave tire I designing it from scratch, to incorporate cords into a fabric. The cords are then coated and fused with rubber to form thin sheets known as pires. Next - the plies are put together (usually four to a passenger-car tire) to make the cord body or carcass. To this is molded the rubber tread and sidewalls of a tire.

important

As you can see, the cord in a tire IS its mainstay, its muscle-literally the fabric that holds a tire together, largely determining its degree of strength and endurance.

But what you might logically wonder at this point is whether there's much difference between one cord and another. The answer is yes - especially with the introduction of TYREX tire cord, hailed as a major scientific breakthrough in this field.

How TYREX tire cord differs from rayon and nylon - Both rayon and nylon are basically adaptations of fibers originally produced for textile uses. Obviously, the properties required of a tire cord are distinctly different from those deemed suitable for clothing or home furnishings. In response to these inadequacies of existing fibers, research scientists developed a material specifically engineered for tire cord. This is how TYREX tire cord came about, and how it was possible, in

the good points of other tire cords while elic inating their weaknesses. Because TYREX to cord is a fiber produced from cellulose (ti same material nature uses to give strength trees and other plants), it has a built-in dime sional stability relatively unaffected by varyid conditions of heat, cold, and excessive strail

Which tire cord is the best for you in this day of modern technology and hig powered competition, it is often difficult judge for ourselves what is the best product buy. Fortunately, this is not the case with ti cords.

We have a sound bench mark to judge by . the automobile manufacturers of America .

It is significant that for the past years, car manufacturers have mad tires with TYREX cord origins equipment on every single make American car i

This unanimous endorsement is especially in portant because automotive manufacture won't use a product until they test it for ther selves and know what they're getting. After a with the good names of their cars at stak nothing but the best will do.

# how to decipher those tire-size figures

Using a 6.70 x 15 tire as an example
—"6.70" means six and seven-tenth
inches and denotes the approximate
cross-section width of the tire (from
sidewall to sidewall) when it's inflated to the manufacturer's recommended air pressure.

The "15" means 15 inches and refers to the diameter of the rim (or wheel) the tire is mounted on.

# 7 WAYS IU SIREI

Constitution of the second of

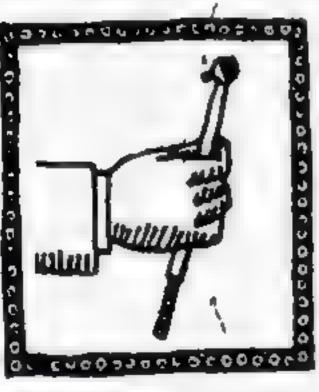
Keep Tires Properly Inflated — You'll find a statement concerning the right amount of air your tires should carry in the owner's manual that came with your car. Many tire experts, however, recommend these pressures as a general rule: Keep 28 pounds of air all around in 14" or 15" tires; 30 pounds all around in 16" tires.

2



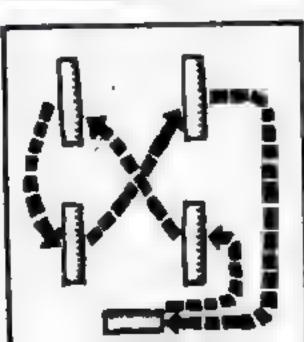
Go Easy On New Tires — Stick to new-car speeds when you're breaking in new tires: 100 miles at 40 m.p.h., then 500 miles at 50 m.p.h. This will give cords a chance to mesh and flex together before the going gets rough. Your tires will last longer, say Detroit test drivers, if they get through the first 5,000 miles without abuse.

3



Check Air Pressure — After you put on new tires keep tabs on the air pressure. (Get an accurate tirgauge and keep it in your car). During the first feed days of use, new tires tend to lose pressure. Under inflation can kill a tire . . . shorten its life by 20% So be on your guard, especially during the crucial breaking-in period.

POPULAT ACIENCE WITY 1940



Rotate New Tires Every 2,000 Miles — This is one of the best ways to get your tires to last, Have all five tires rotated every 2,000 miles for the first 10,000 miles. After 10,000 miles, rotate at 5,000 mile intervals. When tires are not rotated, uneven were can lead to shimmy, vibration, noise, or a bumpy rid (See chart for proper tire rotation.)

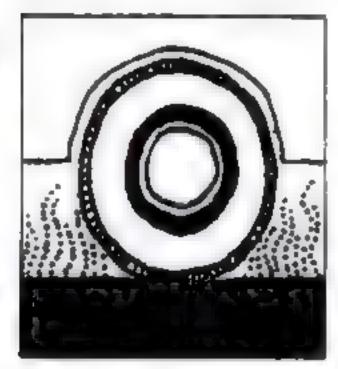
# CH TIRE MILEAGE

5



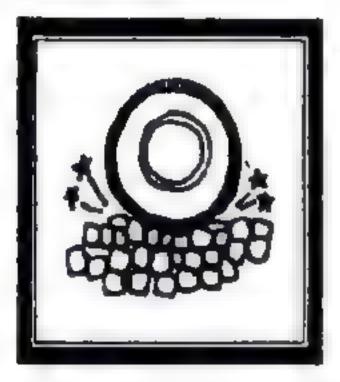
Don't Be a Speed Demon — Sustained speed builds up high temperatures, and heat can tear a tire to pieces. Excessive speed also causes dangerous distortion in tires (more severe when tires are overloaded or under-inflated) which in itself causes tremendous heat build-up. This kind of strain can cause a tire to literally come apart. At 80 m.p.h. you can expect only 20% of normal tread wear.

6



Leave Hot Tires Alone — Never reduce air pressure when tires are hot. A tire is built to take the extra pressure. Bleeding (letting air out) only makes it run hotter. Remember that soft, under-inflated tires are dangerous, causing sidewalls to flex, friction to increase. In fact when high sustained speeds are anticipated, it's a good idea to increase air pressure four pounds above normally recommended cold-starting pressure.

7



Be Kind To Your Tires — Bumping or scraping curbs, turning corners too sharply, stopping too suddenly, starting too abruptly, driving too fast over bumps and ruts, is the quickest way to wear out a tire. There's strain enough on tires in ordinary driving without piling on extra punishment! So take it easy. Treat your tires with care for longer wear,





# keep your car fit for longer tire life!

#### Check:

EXCESSIVE CAMBER: When wheels are tilted inward or outward, it causes rapid wear on one side of your tires.

PRONOUNCED TOE-IN OR TOE-OUT OF WHEELS: This condition usually shows up as "feathered edge" on tires and in abnormally rapid wear.

FAULTY OR GRABBING BRAKES: You can recognize this trouble by bald spots — the same symptom produced by unbalanced wheels.

IMPERFECT OR WORN SHOCK ABSORBERS: Not only do faulty shocks cause irregular tire wear but they may also lead to other mechanical irregularities,

FRONT-WHEEL ALIGNMENT: Excessive wear around one side of tread is a sign of bad alignment . . . can ruin new tires in days. Check alignment at least every 10,000 miles.

WHEEL BALANCE: Heavy side of unbalanced tires slams hard against road, causing worn or bald spots, "Bumping" can often be felt in steering wheel. Check wheel balance even on new cars.

# tips about tubeless tires

WHEEL RIMS MUST BE IN A-1 SHAPE — Leaks can be caused in a tubeless tire by dented or rust-pitted wheel rim or by loose rivets in rim. Have rims checked before buying tubeless tires.

EVEN A SPECK OF DIRT IS DANGEROUS — It's important that tubeless tires be mounted carefully. Should sand or dirt get between bead and rim, air leaks may result,

**DON'T BE A "ROAD-HOPPER"** — Driving on and off the edge of the road at high speed can cause the loss of air. Also avoid hitting curbs — you may find you have to replace all of the air if you do.

# does it pay to retread?

This is entirely up to you. Taxi fleets, trucking companies and air lines all successfully retread tires for economic reasons. So can you, if your tires have a good recappable carcass. (A rugged carcass is one of the dividends of tires made with TYREX cord.) A good retread job can give you very satisfactory mileage and reliability.



1. Tires made with TYREX cord RUN COOL AND SAFE!
Test after test shows that tires made with TYREX tire cord are highly resistant to heat at modern highway speeds.

2. Tires made with TYREX cord are MORE RESISTANT TO IMPACTS! In grueting accelerated road tests, tires made with TYREX cord averaged less than one-third as many impact breaks as nylon.

3. Tires made with TYREX cord are LONGER WEAR-ING! Tested on taxis, trucks, all models of passenger cars, they regularly give the best mileage, are unaffected by water and moisture.

#### Unmarked Police Cars: Good or Bad?

[Continued from page 100]

time. A car raced past at 85 or 90 m.p.h.,

in clouds of spray.

If we'd been in a marked car, that fellow would have slowed down. Not seeing us, he kept going, which is one argument against unmarks. Melvin swung over to the northbound lane. "We'll be lucky to catch him before he plows into Dover," he said.

Scary work. We rolled, Our speeder was gone from sight. The speedometer needle topped 100. A crossroad came flying toward us. Our siren went on and then off, Suddenly the crossroad was a mile back. This was scary work. For the first time we wished for a marked car, with big red lights. We thought of what a trooper had said: "In a fast chase your stomach turns over. You become emotional, It's hard not to take it out on the fellow you arrest."

Then we saw him far ahead.

Now Melvin had to make a decision: Slow down, pace him a while, and "get a clock on him"? And maybe let him get into Dover's evening traffic? Or sacrifice the "clock" and the conviction, but stop him for the safety of people in that evening traffic? He could be a drunk.

Melvin chose to sacrifice the arrest. He held his speed. Then we were on him, our headlights blinking for attention, our inside ceiling light ar. Our siren shrilled.

Melvin picked up the microphone.

"Car 347 to Dover," he said.

"Go ahead," said Dover.

"Ten forty-one," said Melvin. "One mile south of Dover. White Chevrolet. Jersey." He read off the number.

Coverage by radio. Ten forty-one is code for "Leaving car, Cover me." The dispatcher will keep listening. If he gets no "10-42" signal in five minutes he will send other cars to help. This protects a lone trooper who, stopping dangerous criminals, might get jumped. Our speeder slowed down and stopped.

He was no criminal—just a very astoniahed New Jersey citizen. He claimed he was rushing his mother to a hospital for her nerves. Melvin said: "Well, sir, I can't arrest you because I don't know just how fast you were going. But I am advising you to do no more speeding in Delaware."

"And it's a cinch he won't," he com-

mented, back in Car 347. "Our halo will go with him right up to Jersey." He picked up the mike. "Ten forty-two," he said. "Ten four," drawled Dover, acknowledging.

Our man drove off. He was a very tame driver now. He'd remember for months the police car that came out of nowhere.

Clearly the plain car is a powerful weapon. What we were seeing in Delaware is also happening in many states. In Minnesota recently a "willful speeder" roared up a highway at 85 m.p.h. When he saw a regular police car he slowed

Next Month: Homesick for underwater craft, an ex-Navy man has built his own three-man sub. It's powered by 28 six-volt batteries, is 25 feet long, weight six tons, goes down 200 feet. You'll read about it in August PS.

down and fell in line. The police car turned off and he immediately ran up to 85 again. He'd fooled the cops!

But he didn't fool a plain car traveling right behind him. This one nabbed him.

In Maine, a trooper in a plain car got a radio call for another trooper who was driving a state-police truck a mile behind: "An Olds 88 came up very fast, looked me over, and decided I couldn't catch him in this thing," the caller said. "So he passed me and took off. He's coming your way."

Moments later the Olds appeared in the plain car's mirror, and overtook it at better than 90. Chased and arrested, the driver was startled to find there'd been a trooper in that innocent-looking sedan.

We came away from Delaware feeling that the unmarked car:

 Is a potent weapon against recklessness;

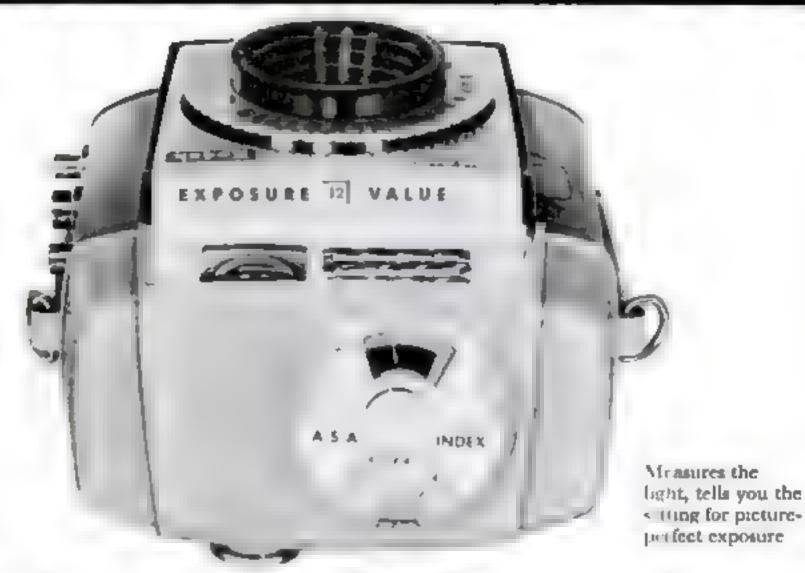
 Can be fairly employed, as it was in Delaware; and

Could be seriously abused by lazy

or dishonest police departments.

And what do cops themselves think of the idea? One thoughtful patrolman confided: "I think most of us would prefer marked cars. But this step has been forced on us. Someday, when people learn to take the road laws seriously, I hope we can go back to the old way."

# New Ideas in Photography



# New Brownie Camera Has Electric-Eye Control

New production methods are making it possible to put deluxe-camera precision into



electric-eye Brownie cameras—yet keep prices down to the traditionally low Brownie cost.

Kodak recently announced the low-cost Brownie Starmeter Camera. Its photoelectric meter system is as sensitive as the meters on top-quality, high-priced numature cameras. And the mechanis i is rugged—built to withstand jolis as great as 50 (v/s.

Brownie Starmeter Camera eliminates exposure guesswork, gets 12 good shots on each roll of size 127 film. Yet it costs only \$19.95, or as little as \$2 down.

Picture it now-See it again and again

#### Everything You Need But the Scene Is Packed in Kodak Gift Outfits

Americans like cameras—and continuence. That's why the big new gift trend today—for family, friends, newlyweds, young people—is the complete camera outfit.

This is a real trend—no fusing around, everything in one box, ready to start shooting! For a quick survey of the way people enjoy buying gift cameras today, visit your Kodak dealer and look at the beautifully gift-boxed Kodak and Brownie outfits. You'll find combinations that fit every gift need—from \$11.35 up.



Most popular outfit includes Brownie Starflash Camera with built-in flasholder, film, flashbulbs, batteries, instructions. All attractively gift-boxed for \$11.35.



Home movie kit—for movies indoors and out —contains new Brownie 8 Movie Camera, f/2.7, and a 2-lamp light bar with reflector flood lamps. \$32 50.

# from Kodak

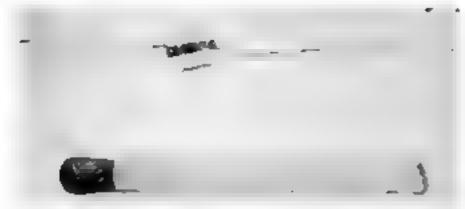
#### Kodak Cell "Sees" Invisible Light, Lends Helping Hand to Weathermen

An ultra-sensitive Kodak heat-sensing device, first created for weapons use, is now helping meteorologists. Called the Kodak Ektron Detector, it forms the "eye" of two new instruments.

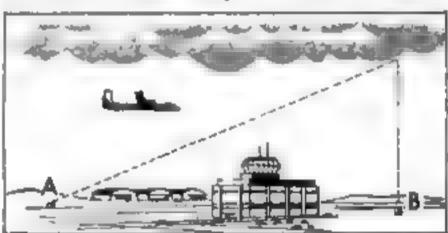
One instrument measures the height of clouds by bouncing a beam of infrared radiation off the base of a cloud formation. The echo is "sensed" by an Ektron Detector stationed a known distance away, and the cloud height is determined by triangulation.

The other instrument measures water vapor in the air. Scientists project two infrared beams of different wave lengths. The first is partially absorbed by water vapor, the second is unaffected. The difference in energy received by a Kodak Extron Detector tells how much moisture is present.

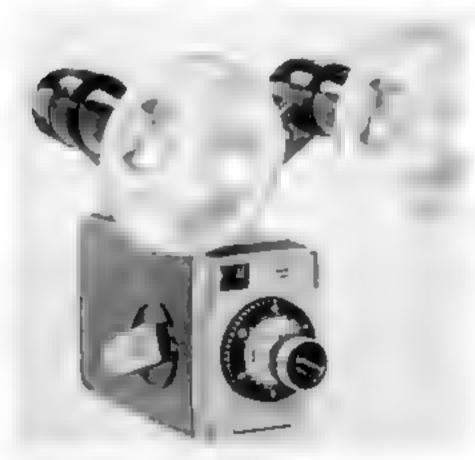
The same kind of Kodak research that develops better ways to see and use light, leads also to finer films, filters, and lenses for amateur and professional use.



Special bits of gioss are coated on one side with lead sulfide or lead selenide photo-conductive materials sensitive to invisible infrared radiation, to form Kodak Ektron Detectors. Picture above shows how Ektron Detector compares in size with a match.



Used chiefly at airports, the cloud-height measuring system is accurate up to 5000 feet. A rotating projector (A) bounces infrared light off the cloud base to the detector (B). The signal is fed to an indicator at the control tower for computation.



#### New Brownie & Movie Light

Fits on top of the Brownie 8 Movie Camera, out of the way. Provides ideal "over-the-camera" illumination for indoor movies. Only \$5.95 (300-watt reflector flood lamps extra).

#### Kodak Movie Comera, Only \$24.501 Uses New "Rabbit Ears" Light Bar

This all-new Brownie 8 Movie Camera makes sharp, clear 8mm movies with snapshot ease. And it's the lowest-priced movie camera in Kodak history.

Outdoors, you just dial a setting like "Bright Sun" or "Open Shade" or, if you prefer, use the f/stop settings. Aim through the enclosed optical viewfinder and shoot—it's that simple.

Indoors, you use a new compact light bar that attaches to the top of the camera for easy handling and ideal lighting.

Other features you'll like: the inch-wide shutter release eliminates fumbling, and the footage meter resets automatically after loading.

Best of all, however—it's yours for as little as \$2.50 down. Ask your photo dealer for a demonstration.

Prices are list, anclude Federal Tax, and are subject to change without nation.

EASTMAN KODAK COMPANY, Rochester 4, N. Y.

SEE KODAK'S "ED SULL VAN SHOW" AND "ADVENTURES OF THE NELSON FAM LY"





# Gus Tricks a

EN minutes? Mind it's no more," grumbled Silas Barnstable. "Time's money."

"So I've heard," agreed Gus wryly.
"But working on that old wreck of yours is selling time pretty cheap, Silas."

The town penny-pincher grunted.

"Look," Gus went on, "you're headed for big repair bills with this antique of yours, and I don't want to hear you squeal when one comes. Turn loose enough cash to get a good car. You'll be doing yourself—and me—a favor."

Silas turned sharp little eyes on Gus. "And you just happen to know of a car for sale, hey? With a bit for Gua Wilson and the Model Garage, no doubt."

Gus snorted in disgust. "You would figure it that way. Just sit and wait."

Ignoring Barnstable, Gus was busy at a bench job when the shop door slammed. "Ted Griswold!" he said in surprise. "What brings you back, young fellow?"

The tall, dark young man grinned "More luck than merit, Gus. The insurance company promoted me to district manager of our branch office here."

"Wonderful! Didn't take them long to find out how good you are, did it? You even look like an executive now."



# Trickster By Martin Bunn

"Come off it, Gus," laughed Griswold. "I'm the kid whose jalopy you used to patch up free."

"No more. I'll charge you double for all jobs on your Highbrow V-8."

"No kidding," Griswold said. "I do need a good car in this job. Fact is, that's

something I want to ask you about." "I don't sell cars, Ted. But we have

some honest dealers in town."

"Don't mean that. The man I'm replacing is moving up to a big company job on the West Coast, flying out tomorrow, and can't take his car. He'll sell his \$1,500 equity for only \$600 if I finish

the payments. It's an almost-new hardtop with only 6,000 miles on it."

Gus nodded, "I think I know it-that'll be Ben Derringer's car."

"Right, and Derringer's sort of a quick, impatient chap. He said he'd hold the car until noon today, then sell it to the first comer."

Gus looked at the shop clock. "Past one now. Have you seen him?"

Griswold shook his head glumly. "Train was late. I reached his house at half past. The family's gone and neighbors told me he had just left to drive up to his summer cottage for some clothing. But nobody knows where his cottage is."

A SHOP chair squeaked as Barnstable shuffled to his feet. "Time's up, Gus. Can't wait while you stand jawing."

Seeing Stan Hicks, his young assistant, drop the hood on Barnstable's car, Gus knew the oil-fouled plugs had been cleaned. He scribbled a bill and gave it to Barnstable, who counted the exact amount out of a cracked wallet. Thoughtfully Gus watched his crankiest customer drive out.

", , . thought you might know, from working on his car," Griswold

was saying.

Gus snapped out of a reverie. "No, Ted. I think only the dealer has serviced that car. Did you check the Hall of Records to find where Derringer's place is?"

"Can't, It's closed Saturdays. I've asked all the

realtors in town."

"Then see if you can find the gas station where Derringer deals," suggested Gus. "They might know. Cheer up—chances are he forgot he'd need the car to go upstate and counts on selling it to you when he gets back tonight."

"Thanks, Gus. I'll try

the stations."

Where'd it come from?



THE WEEK: Dividing time into seven-day intervals was a scheme many ancient civilizations used. The days get their names from the seven heavenly bodies—each associated with a god—that were thought to revolve around the earth.

Sunday: Sun; Monday'
Moon; Tuesday: Mars (Anglo-Saxon "Tiw"); Wednesday: Mercury (Woden);
Thursday: Jupiter (Thor);
Friday: Venus (Frigg); Saturday: Saturn.

rubbing his hands together. "Only 6,000 miles on it."

"Then this is Derringer's car."
"Was, Gus. I bought it legal."

A sense of outrage engulfed Gus, "Legal! You heard Griswold talking to me. You practically stole it from him!"

"Now that's pretty harsh language, Gus," whined Barnstable. "I took your advice, got me a good car. I knew where to find Derringer—his summer place is next to one I have a mortgage on."

"Well, you can take your car—and your business—somewhere else."

The old man flinched. "Now wait, Gus, I ain't set against selling Griswold the car—if I can make a profit on it. But I already had it back to the dealer, same as Derringer did, 'count of that scree-chunk underneath. They said they put new shocks in for Derringer Today they tightened the spring shackles—made me pay for it, too."

"Still clunks, doesn't it? Maybe you'll find this an expensive bar-

gain."

A fine rivulet of sweat rolled down Barnstable's bony nose, "Give it a road test at least, Gus."

Gus glared at him, then shrugged, "Wait till I give Stan some orders."

THE following Monday, just as Gus was thinking of lunch, an imperious horn sounded outside the big shop door, and a moment later a sleek hardtop sedan swept into the garage. But as it crested the concrete apron, Gus's sharp ears caught a dry chunk from beneath the car.

"I see you got it, Ted—and it sure is—" Congratulations froze on Gus's tongue as the car door opened and Silas

Barnstable stepped out.

"Well, don't stand there gaping," snapped the town's stinglest man. "Never seen an almost-new car before?"

"Yes, but never you in one," admitted Gus. "Who did you rob, Silas?"

"I did make a good deal," said Silas,

FAR back in the shop, Gus gave Stan low-voiced instructions, then returned. "When does it make that racket?" he

asked Barnstable, getting in.

"Any time I go up a driveway or hit

a dip in the road."

Gus put the automatic drive in reverse and backed out. As the rear wheels clumbed the apron slope, an unnerving clunk came from under the car. It was briefly repeated when the car climbed down the outside. Gus shook his head thoughtfully.

"Bad, hey?" asked Barnstable.

Grim-lipped, Gus said nothing. He drove slowly a block or two. When he coasted up a driveway slope to make a

# ANOTHER WORLD'S RECORD SET WITH **CHAMPION SPARK** PLUGS!

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In both inboard and outboard marine engines, Champions are the plugs that set most of the records, and win most of the races. In 1959, for example, all 11 winners of the National Outboard Championships were powered by Champion spark plugs. Also 8 out of 10 winners of the '59 National Stock Outboard Championships-plus 13 of 14 winners of the '59 National Outboard Association Championships!

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engine. For racing, skiing, cruising or trolling, you can depend on Champion spark plugs.



CHAMPION SPARK PLUG COMPANY, TOLEDO 1, DRID



U turn, there was no noise But it occurred again on the Model Garage apron.

"What'll it cost?" asked Barnstable. Gus shook his head. "The way you feel about repair bills, Sılas, I don't want

to take on this job."

As he and Barnstable stepped from the car, Ted Griswold sauntered up. "Hello, Gus, Came to tell you I still need a car. This one for sale?"

Gus grunted, "If so, don't buy it."

Barnstable drew Gus away. "What is it, Gus? A bum rear end, or is the automatic transmission shot?" he whispered.

"I'd rather the dealer told you, Silas.

No charge for the road test."

Gus walked off. Barnstable hastily looked about for Griswold. "Hey, young fellow. Want to buy this car?"

"Hold it, Ted," warned Gus. "I'll



charge you just as much to repair it as I would Silas."

Griswold nodded, withdrew into muttered conversation with Barnstable.

TEN minutes later, Barnstable shuffled out. Griswold approached Gus, smiling.

"I saw Derringer that night; he'd already sold it—for \$550. I paid Barnstable \$600."

Gus chuckled. "Leave it to Silas to turn a profit somehow, every time!" "Okay by me," said Griswold, "It's a swell car—whatever's wrong with it. Is it the clunk I heard when you drove in that scared him into selling?"

"Right. Sounds loudest in cars having automatic transmissions, because even slight seepage of transmission fluid at the rear seal can wash the lubricant out of the drive-shaft yoke."

"The what?"

"The splined-and-grooved coupling on the front end of the drive shaft. When the car rides over a bump, those splines slide in and out of matching grooves in the transmission, Look,"

Gus jounced the back of the car up and down on its springs. "Not a whisper now, or when you coast over a rise or dip. But when the engine's pulling and drive torque loads the splines, they bind

and then break free with that

noise you heard."

"So that's what outfoxed Barnstable. And why Stan phoned me to come buy the car, no matter what you said about it."

"Sure, All I have to do is drop the shaft and pack the splines with viscous grease." Gus chewed his lips. "I didn't tell Silas it was an expensive job; he just naturally thought so. And after what he'd done, it seemed only fair to let him. At that, it was a dirty trick, and I'm going to tell him. Since he made a few bucks, he can't complain much."

"Nor can I, and he's welcome to the profit. You have my thanks, Gus."

"Save them, Ted. He overheard you in my shop, and I missed the tip-off."

"To what he was going to try?"

"Sure. Silas gave me cast-iron proof when he was in such a big rush to get out. I should've guessed what he was up to and warned you."

"But how could you know?"

"Because," said Gus, "that was the first time Silas ever paid a bill of mine without an argument,"

#### NEXT MONTH: How to Buy a Car ... in the Soviet Union

How many months' wages does it cost the average Russian? How long must be wait? How about service, trade-in, resale? Harry Walton, back from car-hungry Russia, tells you—in August PS—about the Red red tape Ivan goes through to get a car.



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Small, rugged Carb-AlRator is easily installed in either carburator vacuum take-off or intake manifold.

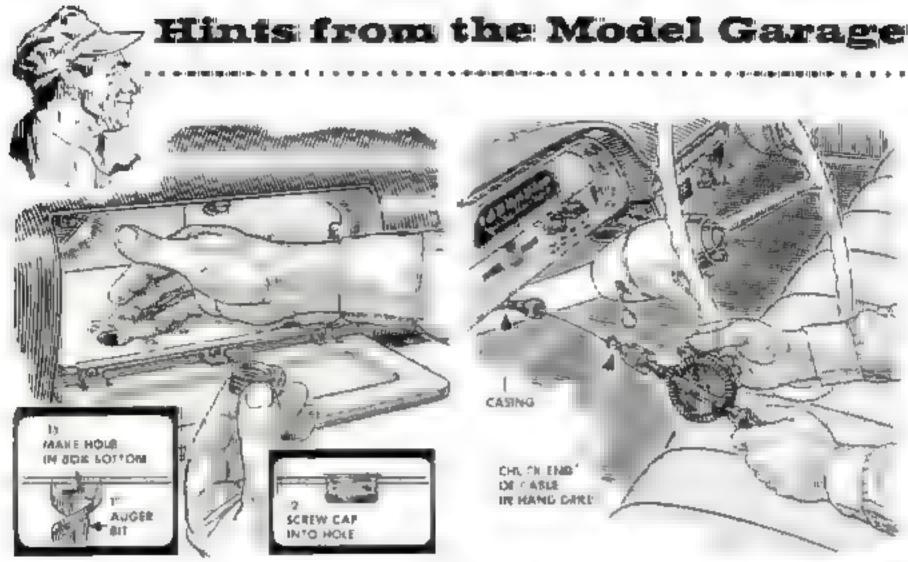
If quality service is your business, ask your UMS distributor about Carb-AlRator and the other fast-moving items in the top-quality Rochester-GM Service Line.

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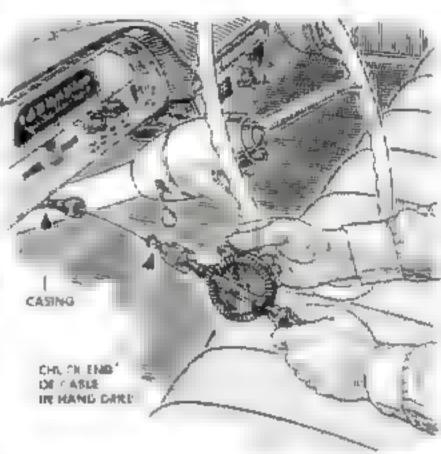


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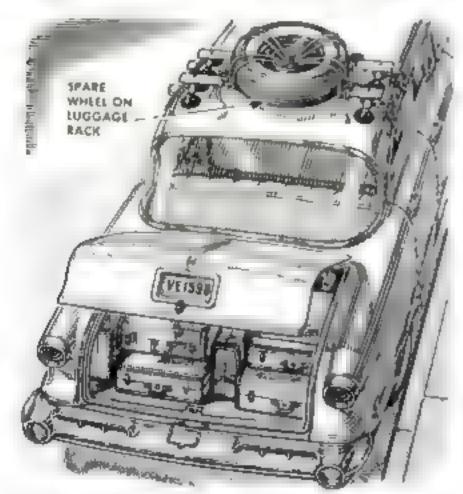
BURETORS



Handy cleanout. For easier cleaning of his glove compartment, one motorist has cut a hole in the bottom and fitted in a screw cap from a can of liquid wax. For cleaning, he removes the cap, sweeps dirt into a bag below the compartment.



Turn in that cable. It's usually difficult to slide a newly greased speedometer cable back into its casing. The job is easier this way: After starting the cable, chuck the end in a hand drill. Then turn the cable as you shove on it.



Touring tip. Said a lady passenger: "Since rain won't hurt the extra tire, why not put it on top of the car and use the whole rear deck for our suitcases?" A sensible idea the bags are protected and the tire is as accessible as ever.



Distress signal. One car owner has made his own warning signals for use when he is forced to stop along the highway after dark. The picture shows how. Mailing tubes covered with reflective tape are slipped over the rear antennas.



# and so is my new HARLEY-DAVIDSON OPPER

Like father, like son . . . happy with the new Topper.

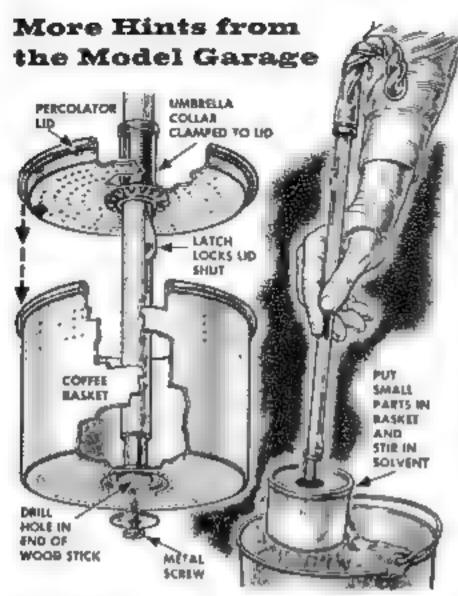
What a ride — gentle as a billowy summer cloud . . . with dual suspension and large foam rubber saddle. Dependability — plenty of get-up-and-go. Automatic Scootaway transmission—no shifting or clutching needed.

Dad is sold on safety features like the large diameter wheels and sure-stop front and rear drum brakes. Tells everyone about Topper economy — up to 100 miles to the gallon.

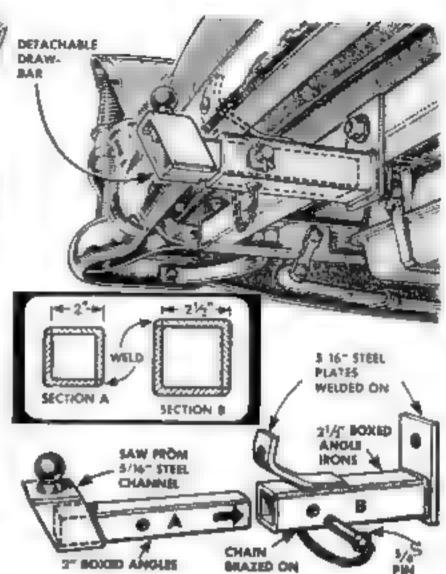
Mom's a Topper fan, too! She likes its good looks: sharp, clean lines molded in tough beautiful fiberglass... two-tone color styling ... chrome-plated instrument panel.

See your Harley-Davidson dealer. He will arrange a fun-filled demonstration ride. Or send in the coupon for literature.

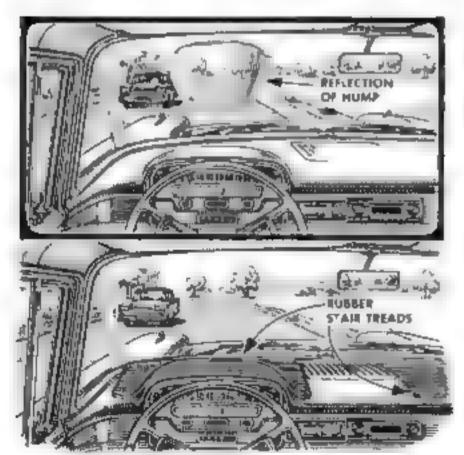
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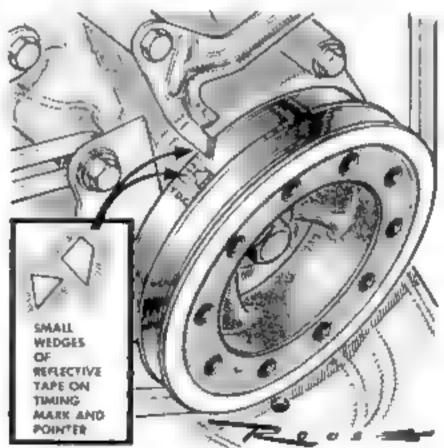
Smalf-parts washer. An old umbrella and the basket from a discarded coffee percolator are the main parts used in making this small-parts washer. Remove the stays from the umbrella collar and fit into the percolator tube.



Detachable hitch. Here's a trailer hitch that's right there when you need it, but that's easily removed when you don't. It's best to weld up section B first, then use this as a form in making section A so that it slips nicely into B.



Overcoming glare. On some cars you get a disturbing sun reflection from the hump of the instrument panel. Draping a rubber stair tread over the hump is one way of overcoming this. A second piece can be put on the passenger side.



A timing tip. Ignition-timing marks often become so dirty that you have difficulty seeing them. When this happens, cut small wedge-shaped pointers from adhesive reflective tape (red is excellent) and press them into place.



Viscosimeter Tube to flow through a standard opening, at a given temperature.

## What viscosity really means

Viscosity is a liquid's resistance to flow. It varies among different liquids, and increases to some extent as temperature drops.

In the United States, the viscosity of oils is usually determined with a Saybolt Universal Viscosimeter. It simply measures the time in seconds required for a given quantity of oil to drain through a standard hole at some fixed temperature. The SAE Motor Oil Viscosity Grade Classification System (see chart above) uses these viscosity seconds to specify the viscosities of its SAE 5W, 10W, 20W, 20, 30, 40 and 50 motor oil grades. The first three "W" grades are especially suited for winter use.

The viscosity of your motor oil is very important. When you start your engine at a subzero temperature, a heavy, slow-flowing oil takes much too long to reach engine parts and permits more wear than thousands of miles of driving.

However, a light, fast-flowing winter oil

does not have enough viscosity to prevent wear at high summer temperatures. Thus, with ordinary oils, it is necessary to change grades seasonally.

Havoline Special 10W-30 Motor Oil is the wisest choice for any car owner because it magically combines the fast-flowing property of the Winter SAE 10W grade with the high temperature, wear-preventing quality of the Summer SAE 30 grade. It's the ideal, all-temperature oil. Use it in all seasons.

In addition, Texaco's special refining and exclusive additives in Havoline Special 10W-30 prevent the harmful sludge deposits and varnish that are so prevalent with ordinary oils in today's stop-and-go driving.

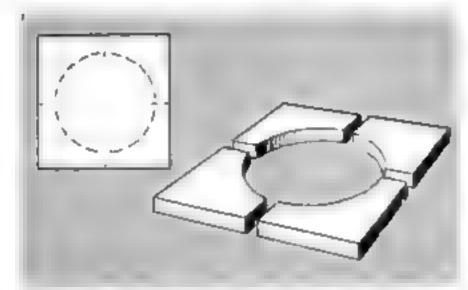
The few extra pennies for this finest of motor oils is your best insurance against engine damage and repair bills. See your

Texaco Dealer for a change to Havoline Special 10W-30 ...and change it regularly.



Buy the best ... buy TEXACO

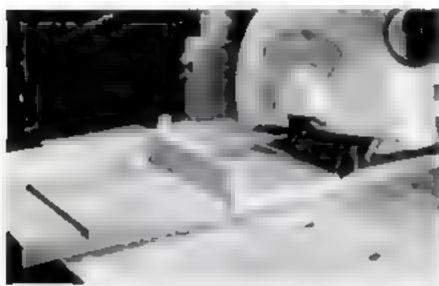




#### **How to Make Shelf Brackets**

IF you can't find shelf brackets small enough for a particular job, you can saw them out of scrap \%" or \%" stock. Cut a circle from a square of the stock with a coping saw or jigsaw. Then cut the remaining piece into four parts, smooth with sandpaper and drill for screws.— Finlay Kerr, West Kirby, England.

WHEN a fluorescent starter goes out of order, you can often start the lamp temporily. Just rotate the tube in both directions in the end holders as if you were screwing it in and out. You may have to twist it several times until it finally lights.—D. E. Williams, Sanger, Cal.



#### Dadoes in Multiple Pieces

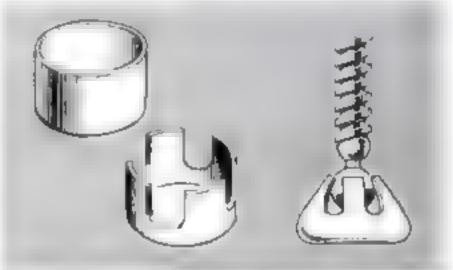
When cutting a series of dadoes across several pieces of the same stock, you can make the job easier by aligning the first or second dado with a block fitted in it. Succeeding cuts on the two or more pieces will then be spaced accurately.—R. J. De Cristoforo, Los Altos Hills, Cal.



#### Giving New Trees a Drink

When new trees and shrubs are planted at Coulee Dam National Recreation Area, a piece of drainage tile is placed vertically in the ground near the roots and filled with gravel. It lets water reach the subsurface without evaporation. When subirrigation is no longer needed, the section of pipe is removed.

PPP FINDING a small tear in the plastic seat covers of my station wagon, I patched it by melting on a square of clear plastic with a soldering gun. I also sewed a ripped seam with six-lb.-test nylon fishing line, using a curved upholstery needle.—
W. M. Watterson, Tampa, Fla.

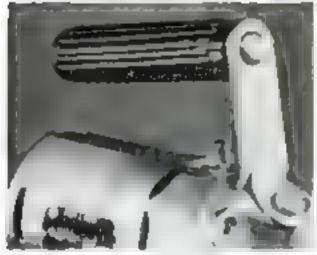


#### Replacing Clamp Swivel

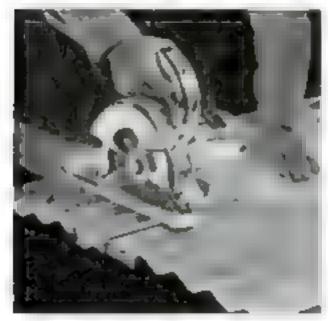
When it becomes necessary to replace a broken swivel nut that covers a C or other screw clamp, try using a pipe cap that will fit loosely over the ball. Notch it to form four prongs, fit it into place and bend the prongs in to clinch them.

—Donald Crepeau, Calumet, Mich.





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[Continued from page 110]

"Those smooth file crescents are safe," McKay says. "The nicks that they replaced were not. Stresses concentrate at a nick—fatigue cracks may result—and the whole turbine may then come unglued at 14,000 r.p.m. But when we file the nick out smoothly, the blade is still safe. It's a lot cheaper than replacing the whole blade."

As we move along, you see other evidences of age and wear. McKay says it is impossible to keep the white undercost of paint on a B-52. The paint is there to reflect the murderous heat of an H-bomb explosion. But it's not as tight as it might be when resisting the 600-m.p.h. air blast encountered on the runs. Repainting at frequent intervals is necessary.

"We have an odd new problem at these low levels we now fly," McKay says. "Bugs. Sometimes we come home with our windshield so clobbered by mosquitoes, May flies, and such that we have a hard time seeing the runway. Experiments are under way to work out a spe-

cial bug cleaner."

The obvious question—isn't flying these B-52 bombers, after nearly six years of hard global practice, getting dangerous now? Not at all, says McKay. A bomber likes to fly. The safety record in B-52s is better now than it has ever been. "We can lose an engine on takeoff," McKay says, "even at maximum load, and get up without any sweat at all. And the bugs—except those on the windshield —have just about vanished from the B-52. It's solid, safe, and easy to handle. It's just a hell of a good airplane—even if it only flies 600 miles an hour," McKay then puts in a plug for the Pratt & Whitney J-57 engine. He says it is one of the most dependable jet engines in the world, and that he has complete confidence in it at any altitude.

On this happy note, let's crawl aboard for a ride over the Hangover Target Range. This is a 40-mile-wide pathway across the lonely forest of northern Maine, dog-legging down the bony mountains of Vermont, then turning west again to end with the target—Watertown, N.Y. We take off from Westover, climb to 30,000 feet going north, and call the Federal Aviation Agency controller in Boston for clearance to go down on the deck into

our penetration run—at tree-top height.
"This is Fireball One," McKay says
to FAA. "Over Princeton VOR at 30,000.
Request clearance to Hangover at 1700."

The Boston controller comes back almost instantly with a clearance. McKay chops power. The idea now is to make a combat letdown—roughly like a freight train falling off a cliff—as the boys would certainly do if they were making a real attack. Your ears dam up and the hatpin-in-eardrum routine begins. You mash your rubber oxygen mask against your nose, mashing your nostrils flat on your face, and blow back through the ear tubes. There's a squeaky snick, and the

pain goes away

Ahead of you is the flat, shined-steel plate of the Atlantic Ocean. It begins to tilt as the bomber starts its diving U turn. The coast of Maine wheels past the windshield at a 45-degree angle. steadies up dead ahead—another kind of ocean, blue-black this time, and made of trees instead of water. The bomber keeps diving until your toes begin to curl up inside your shoes. Your fingers itch to reach over McKay's shoulder and pull back on the yoke. He finally does it for you, and the B-52 hurtles off the ocean and over the pines, with a soft upward lurch from the beach thermal. In 20 seconds you have bugs on the windshield. McKay cusses gently. They aren't too bad-yet.

Up ahead are tall yellow crocuses of cumulus clouds, which have sprouted from the open fields over in Vermont where thermal updrafts have been rising in the hot afternoon. These aren't little bumps. In a few more minutes they will

rock the bomber like haymakers.

Now everybody is on the ball. The navigator has the toughest job, He's too low to get much good from his radar. He must navigate the bomber, at 300 m.p.h., much as a civilian lightplane pilot navigates at 70 m.p.h. He must check the ground against his watch. And when he runs over a lake or a river, he must double-check it on his radar. Doping off, even for a second or so, can get the whole crew lost.

The pilot gives the order for everybody to tighten harness. The thermals are rushing upon the bomber. Soon it is



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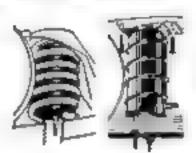
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SAC's New Wespon: Treetop Bombing

wallowing and lurching, but McKay is maintaining his rigid altitude clearance —even when the B-52 smashes through a white wall of rain and a dark cave of clouds housing flickers of lightning. The tail gunner—that unsung hero of the B-52—is now taking a hell of a beating. You, at the center of gravity of the bomber, are belted around a foot or so at a time. The tail gunner, far removed from the center of gravity, is like a man strapped to a monster diving board while a giant bounces up and down on it. It takes a rugged man to hack this mission. particularly at low level; if a man tends to get airsick, he'll certainly produce his

Next Month: A 2,000-m.p.h. airliner? You'll ride it sooner than you think, reports Eliot Toser in August PS. Coast-to-coast time: 80 minutes.

lunch back there. And if something does happen, the tail gunner is strictly on his own. Nobody can crawl back through the clutter of struts and tubes, past the re-

tracted wheels, to help him.

The B-52 rounds the corner. Out of Maine it bores down the Vermont ridges, tightly controlled from Boston—and by McKay and his boys. It takes a hard right toward New York State, and tears toward Watertown at better than 300 m.p.h. Before reaching Watertown, it rises steeply to 16,000 feet, for a "long-look" bomb run, clicks off its release point, and is scored by a Radar Bomb Scoring crew in an electronics van on the ground.

The folks in Watertown do not get mad at this racket. They know that it is our most potent way of keeping aggressors off our backs. They are proud to have the B-52s come over—and while some of them grumbled at first, they are not grumbling any more, now that they ap-

preciate what is going on.

With the low-level attack completed, Major McKay does not go straight home to Westover. He goes up to Montreal and practices some high-level bomb runs. SAC has never been eager to pin all its faith to any one maneuver—even one as potent as this low-level mission—and they are not letting any part of their technique get rusty.

## Tunnel to Connect England and France [Continued from page 69]

cutting tool. So the builders can dispense with compressed air, tunneling shields, and the laborious drilling-andblasting procedure of traditional underwater tunneling.

Tunnel-boring mechanical moles large enough, and more, for the Channel job exist. One tungsten-carbidetoothed type recently bored 291/2-footdiameter water tunnels at the Oahe Dam project in South Dakota. Makers of this machine and of similar ones, given testbore samples of the sub-Channel chalk, reported to the Study Group that it was just what their devices liked to chew into. Their trials showed that a mechanical mole could drive a main Channel tube at an average pace of 1,475 feet monthly. Four machines, simultaneously advancing in pairs from each portal. could excavate the twin tubes in less than five years.

The service passage would be bored first. As it explored the rock strata, pressurized cement would plug any flaws exposed, to prepare the way for the big tubes. Rock from the larger excavations would be removed through the service tunnel, by pulverizing it and flushing it through hydraulic pipelines.

A 15-inch layer of concrete, the only lining needed for the main tunnels, would provide a smooth interior wall and seal the tunnel further against seepage.

Complete with railway equipment, the tunnel can be built for \$305,200,000, the Study Group estimates. Its traffic capacity is seen as ample for decades to come. It can carry at least 1,800 motor vehicles and their 4,200 passengers an hour, each way, plus passengers and freight in conventional trains.

An alternate engineering plan for building a rail tunnel, of equal capacity, is also offered by the Study Group. Instead of being bored through the sea bed, the tunnel could be laid in a trench on the Channel floor, by sinking and joining prefabricated sections of a single 45-foot-diameter tube with double tracks. It would take a beeline path across the Channel—a mile shorter than the route of the bored tunnel, which winds a little to follow the favorable chalk formation. It could be completed in four years instead of five. But it would cost \$315,120,-

# HOW A FEW LOW-COST PARTS CAN GIVE YOUR CAR THOUSANDS OF EXTRA MILES!

# Which parts to replace is as important as when to replace

Nobody wants to put out good money for an engine overhaul if there's no real need for one. But when key parts such as bearings are too far gone, your car engine can no longer operate efficiently.



#### WHEN TO GET AN OVERHAUL

Know the signs, and you'll know the time. You'll probably notice that your engine has lost much of its original pep. Gas mileage drops off, oil consumption begins to get out of hand . . . and your engine may knock or missire. Your car isn't ready to be retired yet. Do as fleet owners do. Treat your engine to a complete overhaul. Your car will pure like new again.

#### WHICH PARTS NEED REPLACING

Get a first class mechanic, and don't compromise on parts. Parts represent the smallest portion of the cost. You'll probably need new main, connecting rod, and camshaft bearings. These bearings control the amount of oil that lubricates vital parts in your motor. And for bearings to give proper oil clearances, they must be manufactured to tolerances as small as .00025".

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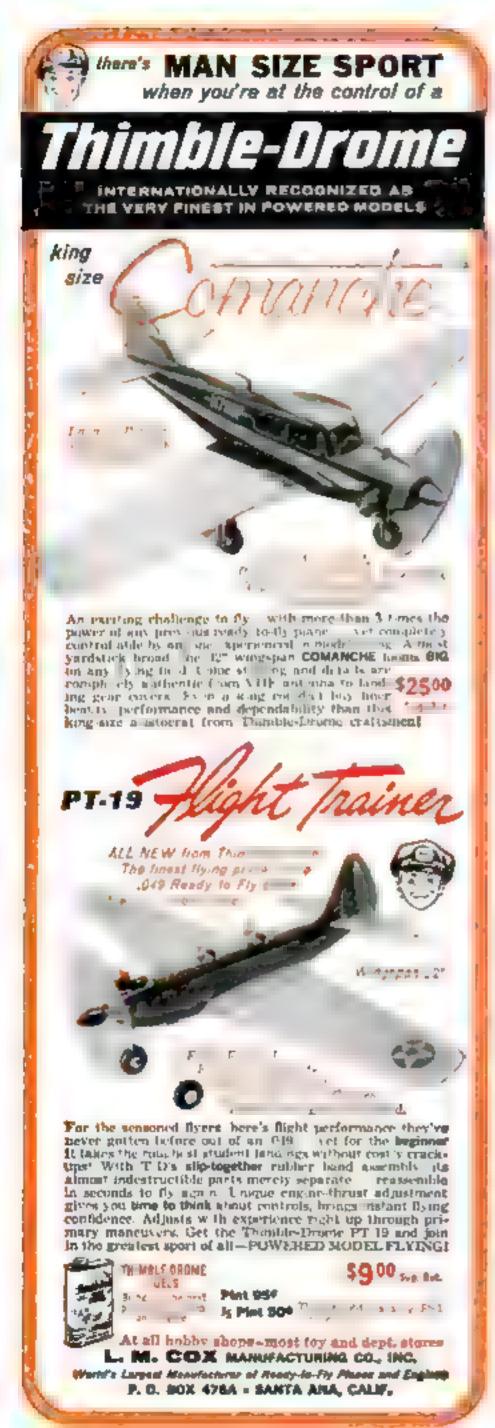


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#### Tunnel to Connect England and France

000, considerably more than the other. So the Study Group, while leaving a choice open, bases most of its figuring on a bored tunnel.

The dream of a Channel Tunnel dates back to 1802 when a French engineer, Roger Mathieu, proposed a submarine tube to Napoleon. By 1881 an actual start was made. The British and French each drove a gallery more than a mile out under the Channel—using early but effective tunnel-boring machines, of which today's mighty ones are direct descendants.

Then British fears arose of invasion by tunnel, and Parliament ordered the work abandoned. Repeated attempts to revive the idea were blocked by success-

ive British governments.

A turning point came in 1955 when Britain's defense minister Harold Macmillan, now Prime Minister, acknowledged that modern weapons and aircraft invalidated strategic objections of the past.

With that, the dormant project came to life. Taking the initiative, a U. S. group called Technical Studies, Inc., sought international collaboration to sponsor a new Channel Tunnel project. The Americans found a ready listener in the Compagnie Financiere de Suez, a worldrenowned canal company without a canal, since Egypt seized the Suez waterway in 1956. Interested too were the English and French Channel Tunnel companies of the 1881 venture—both still in existence, and still holding the rights to build a Channel tube. Joining forces, the four companies formed the Channel Tunnel Study Group.

Behind its present plan lie 2½ years of practical on-the-spot investigation by the Study Group—the most thorough Channel-tunnel survey ever made. By ultramodern methods of geophysical prospecting, ships charted the undersea rock strata through which a tunnel would pass. Frogmen brought up specimens of the sea bed. Test borings added samples from as deep as 226 feet below the Channel floor and 814 feet under the coasts.

All possible ways of spanning the Channel by rail or road were considered by the Study Group. Only one was found less expensive than a rail tunnel. That would be a \$291,800,000 two-lane vehicular tunnel, which could carry only

#### **Tunnel to Connect England and France**

650 vehicles an hour each way—compared to the rail tunnel's 1,800. Its traffic capacity would become inadequate in the near future; its meager earnings in tolls would make it an unattractive investment, anyway.

A more capacious \$321,700,000 vehicular tube would still have less traffic capacity than the rail tunnel, and would be more costly. That would be largely because of the formidable and expensive problem of ventilating a road tunnel—which would require one or two artificial islands for "breather" shafts, and fans totaling up to 56,000 hp.

For other schemes, expense soared. A proposed rail-and-highway Channel bridge of 820-foot spans, with high sections to let the biggest ships pass, would cost a staggering \$506,800,000.

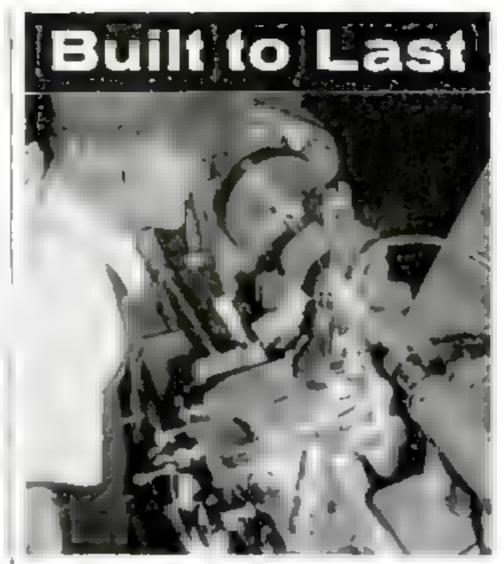
Weighing the alternatives, the Study Group finds a rail tunnel the best answer, at this time. (A future road tunnel might be built alongside it, with the aid of cross passages driven from it.)

The rail tunnel can be built entirely with private funds, and can pay for itself in 35 years, the Study Group says.

Tolls, scaled accordingly, are to be \$16.24 for a motor car and its driver and \$4.48 for each passenger. This offers tourists a substantially lower fare than by sea ferry, and an even greater saving in time; crossing by boat, including waits at each shore, takes at least four hours. The tunnel trip is as fast as by air ferry and much less expensive.

If British and French governments approve the Study Group's plan, the next step would be an Anglo-French treaty setting up an international tunnel company and granting it the needed rights and concessions. Then the tunnel company would raise the money by issuing shares and bonds. It would foot the \$224,000,000 expense of building the "bare" tunnel from portal to portal. The rest of the cost—for track, rail terminals, rolling stock—would be borne by the British and French railways, which would rent and operate the tunnel under a long-term lease.

The Study Group expects the two governments to take some months to reach a definite decision, possibly by early 1961, Actual digging could begin the following year.



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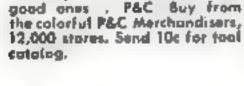
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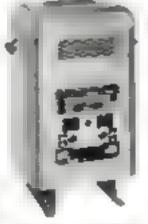
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EMERSON ELECTRIC of St. Louis 8100 Florissent of St. Louis 387Me



#### Tanks That Walk and Jump

[Continued from page 54]

tions. The gears will prevent teethrattling jolts to the crew, he hopes.

The newly built model has four feet that look like square wheels. They overlap each other almost completely, two on each side of the body. They are moved up, forward, and down by a nightmare of levers requiring nine pivot points for each foot. The action is ungainly and inefficient: Two feet move together while the other two support the vehicle, but all four rest on the ground 40 percent of the time.

The object, however, is not grace but speed. And Professor Shigly is shooting for at least 20 m.p.h. Even half that would elicit hurrahs from the Army.

Research from the ground up. Vehicles with legs are only one small part in the research program of the Army's Land Locomotion Research Laboratory at the Detroit Arsenal. The Laboratory's civilian director is stocky, white-thatched M. G. Bekker, author of The Book about ground vehicles (Theory of Land Locomotion). In it, he maintains that ships and airplanes evolved from a careful study of the machines in their elements that is, in towing tanks and wind tunnels. To build good off-road vehicles, their element—the ground—must be studied. The big modern laboratory outside Detroit houses two huge "soil bins"-10-by-150-foot steel tanks full of dirt-in which wheel and track units can be tested. This fundamental work has already paid off in improved tank treads and an oddball wheel with a flexing tire.

The attempt to imitate animals is, Bekker concedes, a long shot. He points out that Nature is way ahead of man at engineering. Simply copying the motions she has devised won't be enough.

Even the stupidest animals have brains that delicately control muscle action and automatically compensate for missteps.

Muscles are better than any engine. They produce more power, weight for weight, and can adjust their output over wide ranges.

Bones, too, represent an ideal combination of weight, strength, and resilience.

A mechanical animal needs the same masterful combination of structure, power, and coordination. That's not easy. But the Army can't afford to miss a bet.

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## Eight Feet of Space in Yen-Foot Car [Continued from page 58]

ris 850s and scored a first in production cars. Twins under the paint (red, gray, or blue), they are identical products except for grilles and upholstery. You can buy either one stateside for \$1,295 (without heater) P.O.E. New York.

A full 10½ inches shorter than the Fiat 600, the 850 will nip into just 11½ feet of prime, rare American curbside space. It really does seat four comfortably, has 5½ cubic feet of trunk space, plus extra stowage room under the rear seat.

The power package is a four-cylinder OHV engine of 848-cc. (51.8 cu.-in.) displacement. Slightly on the long-stroke side (bore 2.48, stroke 2.69 in.), it puts out 37 hp. at 5,500 revs. The car's 1,288 pounds load it modestly—less than 35 pounds per horsepower, against 45 for the Volkswagen and 60 for the Fiat 600. The score shows in pickup (zero to 50 m.p h. in 17 seconds) and fuel economy. Despite 10-inch wheels and an overall ratio of 3.765:1, the 850 delivers 40 to 45 miles per gallon.

The transmission, synchronized from second up, is built into the engine sump, with the differential alongside. Pour in 4½ quarts of oil and you've lubricated the whole works. This entire drive can be yanked out in just 20 minutes by re-

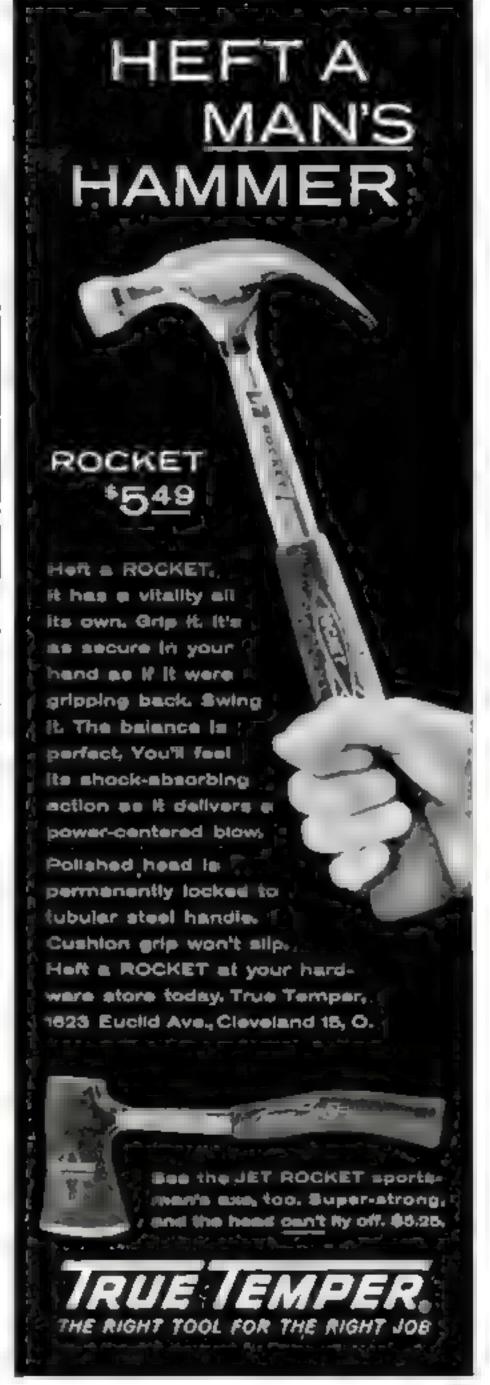
moving 10 bolts.

Look, no springs. The load-carrying elements are oil-can-shaped rubber cones, installed under a load of four tons.

The unitized body is flat underneath except for a shallow tunnel housing the exhaust pipe. Ground clearance is six inches. On the trailing frame at the rear is an automatic valve set in the hydraulic-brake line. Up to 40 pounds of pedal pressure, hydraulic effort is equal on all four wheels. Tromp harder, and all extra pressure is valved to the front shoes, taking advantage of engine weight there.

From the driver's seat, the odd steering-shaft angle gives you a bolt-upright feeling. Close-spaced pedals have to be stepped on tiptoe. Getting out of the car is like stepping out of a bucket.

Give the 850 good marks, though, on maneuverability, road obedience, its 12month warranty, and a tool kit that even includes a grease gun and thickness gauges for the weekend mechanic.





James W Groendyk of Upper Sadd a River M. J. looks over the engine of his prize-winning 1930 Packard Roadster.

"Quaker State keeps my classic Packard in showroom condition, and my new car, too!" The big 364 cu. in. straight 8 has only a 5.3/1 compression ratio, takes 12 quarts of Quaker State. Judged top classic in 1958, it was the first to score 100 points, because the judges could find "no imperfection." If you want to keep your car in perfect condition, insist on Quaker State Motor Oil. Refined from 100% pure Pennsylvania crude oil, it gives long-lasting, complete protection. The finest your money can buy!

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## Mechanical Crab for Ocean Depths [Continued from page 87]

The first cable is only a leash. Under the thrust provided by the propellers, Solaris strains against its hold. That's the secret of the depth control. The propellers' pitch can be varied to increase or decrease the thrust. Balancing off that thrust against the pull of the leash controls the height of Solaris above sea bottom.

The forces involved are the same as those in water skiing—with enough tension on the towing line, a skier planes on top of the water. When the tension drops the skier sinks.

The depth control is mostly automatic. The operator at the console on shipboard knows the topography of the ocean floor and at what depth he wants Solaris to operate. He turns a knob to get proper propeller thrust against cable tension.

Inside Solaris' sphere is a simple strain gauge to measure the pressure of the water. If the height isn't right, a signal travels back along the electrical cable to a servo motor on a winch that the leash-cable wraps around. The servo motor boosts or decreases tension on the leash-cable, as the situation demands.

But what if the console operator discovers on his TV screen that Solaris is on the brink of an ocean-floor trench that it must get into to do its job? The operator simply feeds a signal to the strain gauge that, in effect, reduces its sensitivity. The gauge telegraphs the motor winch, the cable tension is reduced, and Solaris drifts down into the trench.

Through the second cable also flow console commands for maneuvering right or left by changing the pitch on one propeller or the other.

It was Vitro's success in designing the second cable that led to the idea for Solaris. The company produced a torpedo for the Navy that trailed a long control cable behind it when it was shot from its tube. Directions fed through the cable to the torpedo's steering mechanism guided it precisely to its target. Solaris was a logical adaptation.

The Vitro people see no end of usefulness to Solaris. As a seeing-eye robot below the waves, it could discover a new shrimp bed, examine a faulty ship's propeller, or—who knows?—even retrieve long-sunken chests of Spanish doubloons.

### The Amphicar: What It's Like to Drive



AMPHICAR'S ENGINE—a little, four-cylinder Austin—wails when putting out its 39 horsepower.

I hadn't at all. A little jounce on the steep slope had dug her props into the sand and stopped them. Inadvertently, I had kept power on both the wheels and the props.

Taking the prope out of gear, I restarted and revved her up. The opentread tires dug in and we roared out.

Driving around on nearby paved roads I realized that the Amphicar might indeed be very useful for ranchers, sportsmen, and surveyors. The ride is firm, even reminiscent of a cow pony's: You have a tendency to be coming down while the seat is coming up.

But the little car-boat, for all that it is quirky and austere, can still do things that few other vehicles can.

#### FACTS ON THE AMPHICAR

Model: convertible Wheelbase: 80 in.

Track width: front, 48 in.; rear, 50 in. Dimensions: length, 13 6 ft.; width, 5 ft.; height, 3 7 ft., bottom clearance, 8 8

in.; freeboard height, 21.6 in.

Weight: 1,738 lb.

Engine: 4-cyl. in-line, water-cooled,

rear, compression ratio, 8:1.

Tires, 5.60x13.

Clutch: single-disk dry Gears: 4 forward, reverse

Propellers: 2, forward and reverse shift

Turning circle (land): 31.11 ft. Gas mileage. land, 29 m.p.g.;

water, I 61 gal. per hr.

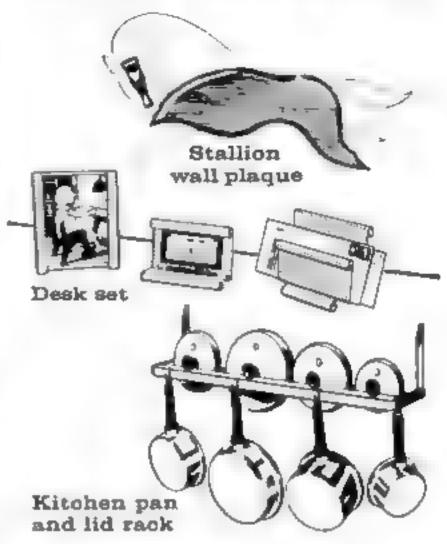
Tank capacity: 10.6 gal

Top speed, land, about 75 m.p.h.;

water, 12 knots

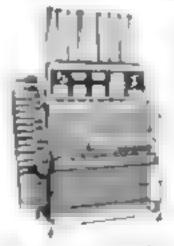
Price: about \$2,900

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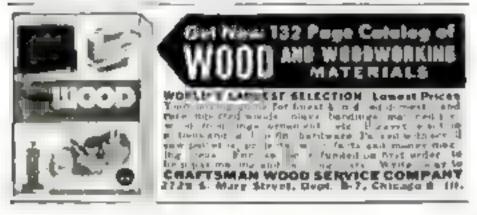
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## The Best Playhouse You Can Build [Continued from page 130]

in front. The top half swings up by means of a rope-and-pulley attachment fitted to the ceiling and back wall. The bottom half drops out as a ramp.

The door opens out one side of the house and thus turns the playroom into a stage. The play-acting phase in children

sets in early and lasts long.

There's a more orthodox entrance via a door with an inside bolt lock. It's four feet high—the proper scale for five-year-olds (average height 3½ feet) but a bit short for eight-year olds (average height a bit over four feet). Fine, the Gesell Institute said. Eight-year-olds will certainly play in the house, but should know it wasn't designed for such "oldsters."

The black hole. But there's a subtler way inside—a tunnel. Concealed in the slide overhang, it's a dark passageway running the six-foot width of the house and entered at either end by crawling through a circle 16 inches in diameter. Halfway along the tunnel there's another hole that leads into the playhouse room.

The fourth wall of the house has a shuttered window just two feet off the floor—the right height for climbing in and out of. A small outside ledge becomes a good hand rail in the process.

When not used for climbing, the window is a good prop. With both shutters open and the ledge now a counter, the window becomes the divider between

grocer and shopper.

The playroom. Inside the house there's nothing—a deliberate blank. The floor is six feet square (neither too big nor too small from a five-year-old's point of view). The ceiling is six feet high, tapering down where the roof takes a bite.

Here's where the kids take over. Wellmeaning parents often discourage children by doing too much for them. Kids don't need window curtains, miniature furniture, dummy kitchen equipment.

A child will drag in whatever he needs to suit the whim of the moment. Sometimes he may just want to feel all closed in—which he can do by bolting the shutters and closing both doors.

Invariably a child will have more fun if you let him choose the way he wants to use the house. It's logical, too. You built the house for him. And a man's

home is his castle, isn't it?

## Pop's Strange Old Flying Machine [Continued from page 171]

Glue and bind one rib above and one below the spar, using a needle to get the threads through the holes and wrapping it crisscross. Then slide in and bind the 1/4" spars of the main plane, and attach the reed outline pieces. Build the elevator the same way, with only one spar.

Cover the frames with lightweight bamboo tissue. Coat the underside of ribs and reed with mucilage, rub the paper into contact, and trim it \(^1/6''\) outside. Turn up and paste this over the edges.

Cover the top the same way, with only \( \frac{1}{10}'' \) overlap. If small wrinkles appear, steam them out.

After covering, pin both planes down on a flat board to prevent warping. When the mucilage is dry, dope and weight the planes flat again. Don't forget to paper

the rear skids and their braces.

Each rubber motor consists of five loops of 1/6" flat rubber, with double-eyed wire hooks at the yoke end. Open the outer eye slightly so that it can be detached and hooked to the winder.

A winder is necessary, for both motors must be wound to equal tension. The

drawing shows how to make one.

If your props are mounted to turn inward (toward each other) at the top, and your winder's main gear is outside, hold the plane upside-down when winding it. With a center-gear winder, hold the plane right-side-up. (It's assumed you'll turn the winder forward, or away from you, which is the easier way.

Flying the twin pusher. See that both wing and elevator are square to the fuselage and centered on it. Make a few trial glides without the rubber motors. Set the planes to give a fast but fairly

flat gliding angle.

Wind the motors 250 turns (about 50 of the winder handle). Hold the ship with the front end tilted slightly upward, release the props, and launch with a vigorous push to get it up to flying speed.

If the racer turns or tips, slide the wing a trifle to the low side. If it dives, slide the elevator forward, higher on the blocks. Once flights are steady, wind the motors to 800 turns.

Record flights were made by stretching the strands almost double normal length while winding. In this way you can put on over a thousand turns.

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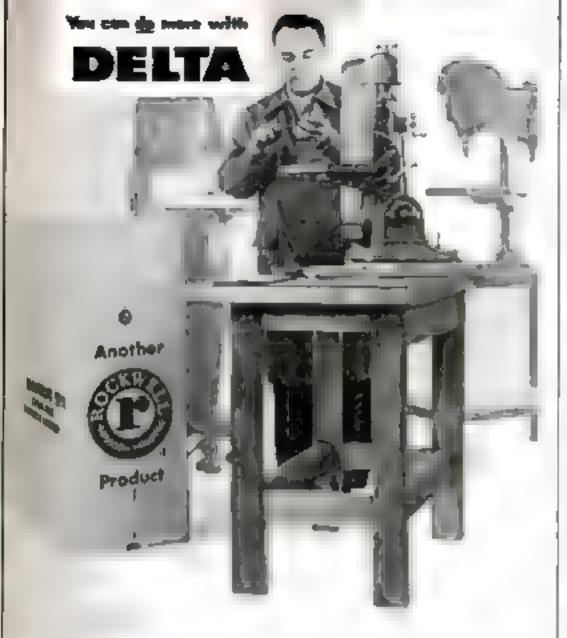
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## Portable Phono Plays Upside Down [Continued from page 146]

acrews through rubber isolation grommets. These grommets should not be compressed when the acrews are tightened, so use either short lengths of metal tubing for spacers or two nuts on the screw—one on each side of the motor board. Drill oversize mounting holes for the tone arm, allowing adjustment to get just the right overhang (see drawing).

The case. Surest way to make the lid and base match exactly is to put the case together as a completely enclosed box—and then saw it apart. Take your exact inside dimensions from measurements of the finished motor board. Be sure to allow for thickness of the material where joints overlap. Use 1/4" hardboard for the sides, 1/6" for top and bottom. All joints are simply glued and clamped until the glue hardens. Sand and paint the case inside and out.

The motor board fits inside the base, resting on 3/4"-by-3/4" aluminum angle attached to three sides. The end is secured to the case with a piano hinge. Angle and hinge are spaced about 7/6" below the top edge of the base. Use another length of piano hinge for the lid. A folding lid support holds the lid open when 10- and 12-inch records are being played. Cover the speaker cutout with screening, grille cloth, or a grille plate, whichever you choose; then mount the speaker with machine screws.

The finishing touches. Solder connecting wires to the amplifier to reach the battery, switch, and speaker. Use one center wire and the braided shield in the tone arm to connect the cartridge to the amplifier input. Leave enough slack so you can solder the ends to the proper terminals before the amplifier is mounted.

Solder a small brass hinge to the rest supplied with the tone arm. Mount as shown in a photo to hold the arm in transit. It folds out of the way when

you want to play records.

You can get plenty of volume for most purposes with the integral speaker as shown. If you turn up the volume too much you may get a howl caused by mechanical feedback. The amplifier will deliver about twice as much power as the set will tolerate with the speaker in the same box. If you want more volume, house the speaker in a separate box.

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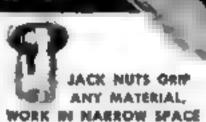
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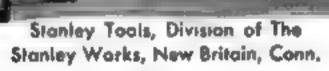
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#### How Parking-Lot Gyps Operate [Continued from page 90]

him out, and tell him to leave the engine

running. It never fails. He's flattered by the royal treatment,"

If you must leave your key in the ignition, don't leave any of your other keys with it. Sometimes burglars work closely with parking attendants. Not only does the attendant let the burglar "borrow" cars, but he helps build up a prospective list of lootings as well.

Suppose all your keys, including those to your home and office, are in the case with the ignition key. Suppose, too-as is often the practice—that the case carries your identification or registration card. All that the attendant, in cahoots with a burglar, has to do is duplicate your keys, including your ignition key.

If the burglar tails you, picks up your car where you park it, drives it into your own driveway and loots your belongings at his leisure, what neighbor is going to get suspicious?

#### "Renting" cars to criminals

Sometimes attendants rent out parked cars to criminals. The attendants know the habits of their regular customers. They know at what hour a car will be claimed. The "rented" car brings the attendant up to \$25 an hour. If the criminal driving it encounters trouble, he can abandon it. To the police, it's only one of thousands of cars stolen from parking lots all over the country.

You have one way of being reasonably safe from this. If the lot insists that you leave the ignition key, make a note of your mileage reading. Even so, a cunning attendant can rent out your car and dis-

connect the odometer.

The service-while-you-park lots have other ways of making a fast buck. You will be charged for an oil change, when all that has been done is to add a quart to bring up the dipatick reading. And how often do you check your chassis when you've asked for a grease job. Charging for it, and not doing it, is pure gravy. If you have ordered 10 gallons of gas, how can you argue that you got only eight? You weren't around.

Be wary. Be suspicious. If you do get booked by a dishonest attendant, report it promptly to the police. It's the only way such thievery can be stamped out.



FLYING MACHINE. Called a reaction-control simulator, this strange device in Boeing's Seattle lab is subjected to conditions like those in airless outer space. Instead of rudders, elevators, and ailerons, flight controls such as blasts of gas, flywheels, and gyroscopes are tested



MERRYMOBILE. This attentiongrabbing three-wheeler is made by the Merrymobile Co. of Memphis for icecream vendors, Production schedule for the year is about 100 Merrymobiles. It's powered by an International engine developing 18 hp. The engine also powers a one-hp. compressor for refrigeration.



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## How I Built the Flying Cart [Continued from page 164]

68 pounds to balance with the motor not running—only four pounds when it was turned on.

Scarcely a resounding success. But in spite of air leaks, turbulence, fan inefficiency, and high weight-to-power ratio—I was getting 64 pounds of lift. It wasn't hard to think up reasons for going ahead.

The one that worked. Poring over all the research papers I could find, I came

up with these rough specs:

Shape—square. For a given area, power, and operating height, the shape with the shortest perimeter gives the most lift. A square is the closest practical approach to the optimum circular shape.

• Size—5' by 5'. The most significant factor in GEM performance is the "height-diameter" ratio (h/d). Within limits you can trade one for the other and carry the same load. A larger vehicle would operate higher off the ground, but it becomes clumsy to use and a problem to store.

 Design—plenum chamber. This is like an inverted saucer with the air cushion retained inside the bowl. It's the simplest of the proven GEM configurations, and gives good hovering efficiency close to the ground.

Power—chain-saw engine. The tentative design promised to lift about 30 to 35 pounds per horsepower, as nearly as I could estimate. A reasonable payload would require five hp. The lightest five hp. I could think of was a chain-saw engine.

• Propeller— ??? This turned out to be a shopping problem. I was getting discouraged about finding one that would fit the shaft, blow the right way for engine rotation, and provide optimum load for the engine. But a half-dozen problems were solved at once when the Airboats unit was suggested to me. It uses a five-hp. Power Products chain-saw engine with reversed rotation and has a properly matched prop.

Building the airframe. Problem: How do you make a close-fitting duct for the fan and a smoothly contoured bowl for the plenum chamber with ordinary woodworking tools? Fiber-glass laminate would give the needed shapes, but would be complex to mold, and also would be too heavy in the required strength. A skilled tinsmith could do it with sheet alumi-



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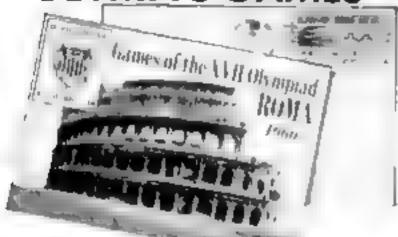
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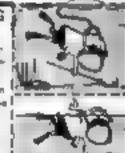
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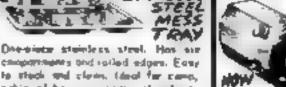


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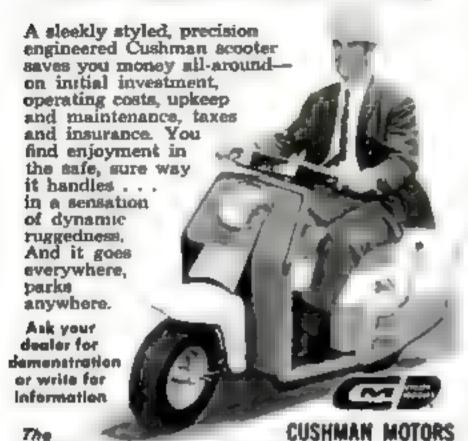
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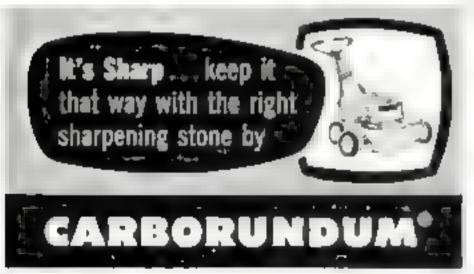
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### How I Built the Flying Cart

num, using aircraft-type construction, but that was beyond me.

Plywood frames sawed to shape and covered with a skin of aluminum and plastic were the answer. The final design proved to be easy to build and turned out surprisingly strong and rigid for its weight. The completed machine, including the engine, weighs only 80 pounds.

Building the Flying Cart. First I cut out the two 32" squares of 1/2" plywood and the eight 3/8" plywood struts. I made a trial assembly of these parts, which form the backbone of the vehicle, using 5" bolts and TeeNuts to clamp it together. All other dimensions were taken directly from this framework. After all the wood framing members of the "hull" were nicely fitted, they were taken apart and reassembled, with waterproof glue and wood screws for all joints.

The sheet aluminum was fastened on next. The inner edge was screwed to the 1/2" plywood first. The sheet was then pushed in tight against the inner curve of the struts and the bottom edge screwed to the one-by-two bottom frame. The 1/2" overhang at each end of the aluminum sheet was snipped every 11/2", the lip hammered flat against the strut and stapled with a stapling gun. The fan shroud went on next, with the top and bottom edges fastened in a similar fashion.

Enclosure of the plenum chamber was completed by clamping aix-mil polyethylene across the corners, using the two 1/a"-by-1" aluminum strips and the sawedto-shape 1/4"-plywood bottom piece.

The deck was assembled dry, placed in position and the notches for the struts marked. After the notches were cut, it was reassembled, with glue and screws.

First tryout. I didn't wait for such niceties as handles, throttle control, blade guard, and proper motor support, to see if it would work. With the major structure finished, I bolted a pair of angles directly to the frame to support the motor.

The engine took hold on the third pull of the starter rope. With a roar from the unmuffled exhaust and a cloud of dust from my driveway as it was swept clean by the air blast, the Flying Cart was first airborne at dusk one Sunday afternoon. It rose about three inches from the ground and hovered there. Startled faces popped up in neighboring windows

### How I Built the Flying Cart

and a horde of small fry materialized from nowhere. Cries of "What is it?" were soon replaced by, "Can I ride?"

I soon paid for my impatience. The motor support proved to be too limber and vibration broke the straps holding

the gas tank.

Back in the shop, the motor support was stiffened by clamping the ends of the angles tightly between hardwood blocks and adding a second pair perpendicular to the first. Handles and flexible-cable throttle control came next.

Remembering the demand for rides, I made a removable platform to cover the engine. Supporting legs went through 1" holes in the deck and top main frame and were anchored with slip-in floor flanges screwed to the bottom main frame.

Early trials of the finished vehicle quickly led to the first two modifications. It would carry a load nicely on smooth payement, but got into trouble on rough ground or going over a curb. A flexible skirt at the bottom caused the rigid part of the craft to ride high enough to clear obstacles. The skirt easily conforms to uneven surfaces and retains the air seal. This also eliminated most of the pushing in climbing hills. By holding the machine level on a slope, all the air escapes on the downhill side, thus providing thrust to push the cart uphill.

If you let go of the handles, reaction to the prop torque made the whole cart spin around. Vanes set in the air stream counteracted this, after a bit of fussing to get the correct pitch. An unexpected bonus resulted: The vanes seemed to smooth the air flow in the plenum chamber and gave a measurable improvement

in lift.

The plastic corners are a considerable aid to the experimenter. With cloth ribbons stuck to various surfaces inside the chamber, a light shining through one corner will let you observe air-flow patterns through the other three. Some curious things have shown up. Under certain operating conditions, part of the air flow seems to want to give a negative lift, It may actually be creating a suction that is limiting the operating height of the vehicle. Next step: modification of the air flow to eliminate this apparent negative lift. The machine may yet prove to be large enough to ride successfully.

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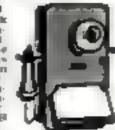
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The riddle of the Sphinx. Oedipus rightly guessed that the creature was man in his three ages: as a baby crawling on all fours. as an adult standing on two feet, as an old man leaning on a cane.

The three gods. The gods' statements reduce to:

A: "B is the God of Truth."

B: "I am the God of Diplomacy" C "B is the God of Falsehood."

A's statement makes it impossible for A to be the God of Truth. So does B's statement about himself. Therefore C must be the God of Truth. That means his statement is true. So B is the God of Falsehood, And that makes A the God of Diplomacy.

Relatives. 1) It's a grandfather, a father, and a son who sit down to breakfast. The father then satisfies two conditions. He is both a father and a son.

2) "Don't be silly, ma," said the little

Indian

One—through a lot of cousin marriages. This is how it's possible: The host's mother has two brothers: Brother I and Brother II.

The host has a brother who married a

cousin, a daughter of Brother I.

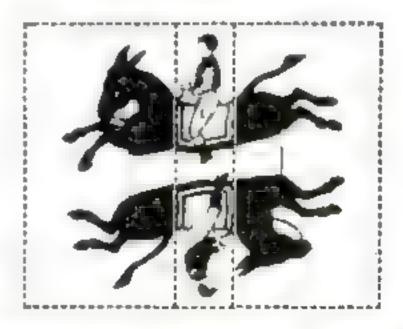
The host has a sister who also married a cousin, the son of Brother I

The host himself married another cousin.

a daughter of Brother II.

In this way, Brother I (the host's uncle) is the host's father's brother-in-law, his brother's father-in-law, his brother-in-law's father, his father-in-law's brother. You can draw a genealogy chart to check if you like.

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